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Can Games Work for You? - Teacher Perceptions of Gamification in Mathematics Grades 6-8

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By

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Dedication

When I first started this journey in Summer 2015, I spoke with my mom about going back to school to work on a doctoral degree. We would have conversations about how long it would take and where I am getting the money from. She made a huge emphasis on where the money would come from. As classes went along, she would check on me and asked if I needed help. My mom was clearly not going to help me, but it was the gesture that ensured her full support. In 2017, my mother shared with me that she had cancer and she passed in October of the same year. I was devastated and prayed that God would keep me together through this process. As the months progressed, I would question whether I would let this affect me to the point of stopping. I have come to realize that when you lose people in your life, others will provide the support of what was lost. You must be accepting of those people and the new reality you face. At this point, I knew that my mom wanted me to continue with life and the personal commitments I made. I would like my dedication to present a person who has always persevered in providing me a nurturing environment. She instilled in me that education is a key component to becoming an integral and successful contributor to our society. I know that my mother, Josephine Wyne Staley Brigham, is in Heaven and proud of what I have accomplished. I will never forget the lessons you have taught me.

Acknowledgement

To Dr. Belinda Edwards, I want to thank you for being a nurturing figure to me. When I first started this dissertation journey, I was, as Dr. Nita Paris would say, in the cloud. You helped me get organized so I could see the process through. You encouraged me from the start, and I cannot express enough appreciation for the effort you put into me. Thank you for being my committee chair, mentor and inspiration to continue and finish my program.

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To my friends and family, I will remember the methods used to keep me on a straight path to finishing. There were a lot of nights where I needed to focus and was assisted by my friends. They would call me just to say: "Do your work". After those words were uttered, the call would disconnect. Now, I can make up for the time spent by celebrating with those who supported me.

Abstract

Gamification is a well-known concept that has been introduced to settings within the K-12 educational systems, post-secondary education and various business settings. However, a literature review reveals a lack of research to inform how teachers perceive the use of gamification within grades 6-8 classrooms as an instructional method to enhance student achievement. As a math teacher/researcher, it is important to investigate various factors or instructional methods that can potentially enhance student achievement. This qualitative study aims to examine how middle-grade mathematics teachers perceive gamification within their classroom setting. It will also explore the possible benefits and challenges of implementing gamification. An analysis determined that participants found benefits and challenges to implementation. Using gamification, as defined by Kapp (2016), three participants (from each grade level: 6^{th}-8^{th}) disclosed their prior knowledge about the concept, designed a game, discussed any benefits/challenges to implementation, and summarized best practices for gamification. The methodology included a framework that utilized constant comparative and thematic analysis. Overall, teachers described engagement as a major benefit to implementing gamification in a classroom setting. Future research should be conducted to assist in providing additional data pertaining to teacher perception of gamification in Grades 6-8 and its impact on student achievement.

Keywords: mathematics, games, gamification, teacher perception, qualitative, middle school

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CHAPTER 1: INTRODUCTION

Regardless of the subject matter, the goal of all educators is to provide instruction that ensures success for all students. With diverse individuals entering the profession comes diverse methods for teaching students. Teachers often use traditional teaching methods to provide students with "information" that they receive passively, and where "minimal illustrations" are shown (Bishara, 2015, p. 2315). Bishara's (2015) study displays instances where progression is evident through traditional teaching methods. Other researchers have noted that student learning experiences include regurgitation, teacher-driven or controlled learning situations, which can be viewed as "robotic" (Bhagat, Chang & Chang, 2016, p.134) and do not provide students with an opportunity to reason, problem solve, or engage in higher-order thinking skills (National Council of Teachers of Mathematics [NCTM], 2014). The NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections are important processes that support students in learning mathematics. The Standards for Mathematical Practices (SMPs) describe practices that all teachers should seek to develop in their students. Since the introduction of the NCTM process standards in 2002 and the SMPs in 2010, there has been a shift from traditional teaching methods to a pedagogy that is robust, multi-faceted and capable of meeting the needs of all learners. As a result, researchers/teachers are finding additional instructional practices to engage students in understanding mathematics both conceptually and procedurally.

Currently, students are living in an era that requires the use of higher-order thinking skills, which will require teachers to investigate differentiation strategies to advance their methods of teaching, like gamification (Meredith, 2016). Research has shown that providing instruction through gaming is an effective method for promoting understanding, reasoning and

problem-solving, as well as retaining and learning new information at the high school and post-secondary level (Perdue, 2016; Stott & Neustaedter, 2013; Ross, 2013). However, there remains a lack of literature that details successful attempts of gamification at the middle school level (Grades 6-8).

As a mathematics teacher leader, I ponder about the many facets of education particularly educational issues related to the facilitation of best instructional practices that support students' mathematics learning and understanding. One issue that has stood out is the effective use of games in the classroom, particularly with the mathematics curriculum. As a teacher, I would always find ways for students to play games while learning mathematics. They would enjoy the competitive-like learning environment so I had to be creative in ensuring all students had an opportunity to win something. A student came up to me years after I taught him and asked if I still have the dartboard that students played with when he was in my class. The game aspect was very interesting to the student and he learned how to play it very well. In my classroom, most of the learning experiences related to games were used as reviews for quizzes and tests. My experiences with using games in my classroom as a tool for review has sparked my interest and a desire to assist teachers in creating ways to effectively engage students through the use of games.

Mathematics has always been considered as a universal language (Schwartz, 2000) but there still lies disconnections between people and the subject matter mentioned. Through different trials of research regarding the use of best practices in teaching mathematics, the achievement gap for students has narrowed for many student populations (Waxman, Padron, Shin & Rivera, 2008). Even though the previously stated phenomena occurred, a gap still exists within the mathematics education community. As a result, I am interested in learning how teachers perceive the use gamification in the environment.

Problem Statement

While there is a plethora of literature focused on the success of gamification at the high school and post-secondary level, little is known about its impact on teaching and learning at the middle school level. There are a number of reasons why gamification research has not been conducted at the middle school level. Some reasons include setting, amount of time to plan and implement a game, amount of record keeping a teacher will complete (depending upon the layout of the game; e.g. - scoreboard), and middle school teachers' belief about its effectiveness (Ross, 2013). These variables make it difficult to ascertain whether or not gamification is effective in advancing middle school mathematics teachers' methods of teaching. Therefore, it is beneficial to conduct a study to confirm the usability and impact of gamification across the middle school grades. After completion of the study, middle school teachers will be able to utilize the results of the study to inform their teaching practices. In addition to gaining a better understanding of the impact gamification has on teachers' instructional practices, this study can be used to provide insight concerning its impact on student learning when applied to mathematics teaching.

Significance of the Study

There are evident gaps of literature coming from multiple aspects of gamification. The two main concerns stemming from the lack of literature include a lack of teacher perspective and limited student population. Most of the studies covered in the literature review only reflect voices of high school and college pre-service teachers (Gregg-Harrison & Anderson, 2014; Stott & Neustaedter, 2013; Ross, 2013; to name a few). Researchers have the ability to learn vast information from the viewpoint of pre-service teachers. Unfortunately, the research lacks any insight regarding those who are current, highly-qualified practicing teachers in a school system. The study will consist of participants that are considered stakeholders in middle grades

mathematics education, such as teachers and teacher leaders. According to Palys (2008), it would best serve the researcher to have those who are in the career and have access to students because it will assist in providing a realistic scenario in which qualitative, descriptive data can be collected.

This study will involve teachers that are in the middle grades setting. There is a scarcity of literature regarding gamification practices at the middle school level. As more studies are conducted, data will be available for researchers to further investigate different scenarios of gamification implementation. The following (Table 1) displays a limited list of studies reviewed within the past 5 years and the associated educational setting: elementary, middle, high, post-secondary and other (business, etc. – will be omitted in this study).

Table 1

Search of Studies Related to Gamification and their Educational Setting (Mathematics)

Education Setting	Researcher(s)	Frequency
Elementary	Capell, Tejada & Bosco, 2017; Halloluwa, 2018; Jagust, Boticki & So, 2018	3
Middle	Johan, Puig, Rodriquez, Lopez, Crau & Escayola 2015 (Spain); McIntosh, 2019 (UAE)	2
High	Ross, 2013	1
Post-Secondary	Gregg-Harrison & Anderson, 2014; Faghihi et. al, 2014; Cadavid & Gomez, 2015; Gressick & Langston, 2017; Sari & Altun 2016; Esteves, Pereira, Veiga, Vasco & Veiga, 2018;	6
Studies Omitted		8

After a comprehensive search of peer-reviewed academic journals, the results in Table 1 were populated. Non-math results were omitted from categorization. Although Table 1 is not an

exhaustive list, it speaks to the difficulty of finding ample literature regarding the middle school setting in mathematics.

Purpose of the Study

Throughout the evolution of gamification, many benefits are described in the literature that support the use of it in classroom instruction (Ross, 2013). The aim of this study is to determine if there are any benefits to implementing gamification in the middle school mathematics classroom. The study will also explore middle school mathematics teachers' perceptions when elements of gamification are in use within the classroom.

Because of the lack of analysis at the middle grades level, this study will focus on the impact of gamification within the given educational setting. In order to determine the impact gamification has on mathematics teaching and learning in middle school, the following two questions will be addressed in the study:

1. How do teachers perceive the use of gamification in the middle school mathematics classroom?
2. What are the benefits and challenges identified by mathematics teachers of implementing gamification in the middle school mathematics classroom?

Definition of a Game

It is important to provide a clear explanation of how gamification is defined within a business and educational setting. Individuals who use gamification to enhance or improve student learning will need to be familiar with the structural elements of gamification, as described above; so that they refrain from exploring or facilitating gamification in a classroom setting outside the context of the definitions referenced in this study. Games are very intricate

systems that have become a part of individuals' lives (Marzano, 2010). The elements that make up a game are even more perplexing and give more appreciation to its origin, gamification. A game is "a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction" (Kapp, 2012, p.7). Figure 1 gives a list of the attributes that define a game and establishes a hierarchal meaning:

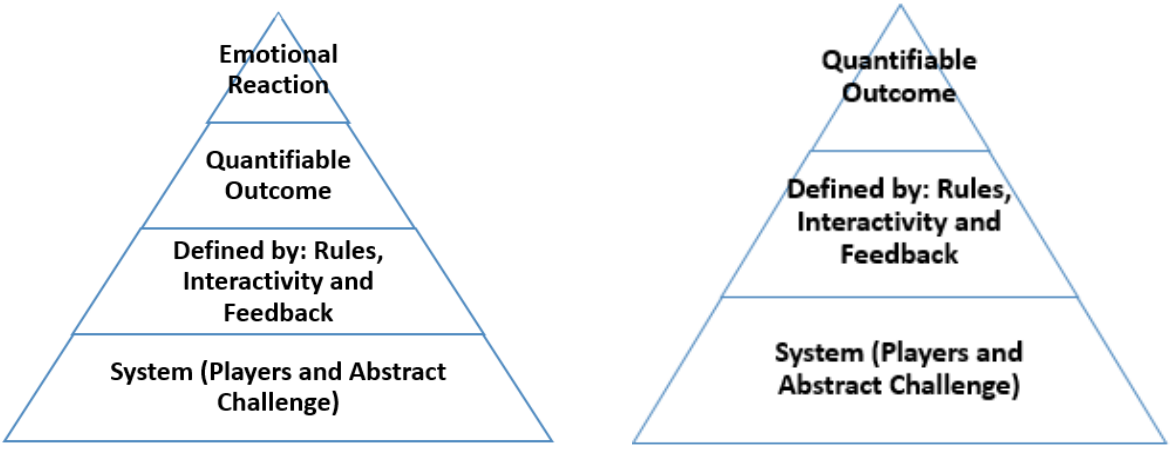

Figure 1. Elements of a Game. Adapted from Kapp's (2012) definition of a "Game"

Based upon Kapp's definition, an emotional reaction occurs "often" (p.7) when an individual participates in a game. However, there are times when an emotional reaction is not always elicited. Kapp's definition can be used to describe many games like: Minecraft, Monopoly, Battleship, Tetris, Super Mario as well as other notable games with similar features, all of which are associated with producing an emotional reaction such as excitement, frustration, challenge, curiosity, and fantasy (Malone, 1980; Yannakakis, & Togelius, 2011). There also exist online games that use electronic devices to achieve an outcome. However, it is important to highlight that a game is not necessarily defined by its digital nature. A game is recognized as such provided it consists of a combination of the defined elements as outlined in Figure 1. Since the

term “game” has been established, the connection between the terms “game” and “gamification” will be explained in order to ground the study.

Definition of Gamification

Developing an understanding of gamification is important to consider when determining its impact on mathematics teaching and learning. Gamification is a term that has been interpreted differently by many researchers and educators who are familiar with the phenomenon. By definition, gamification is the process of introducing “game-based mechanics, aesthetics and game thinking” to produce or increase engagement and motivate individuals or groups (in this study, groups refer to students in the classroom) to solve problems (Kapp, 2012, p. 10). Figure 2 shows how an additional element, promotion of learning, is used to define gamification within the educational realm.

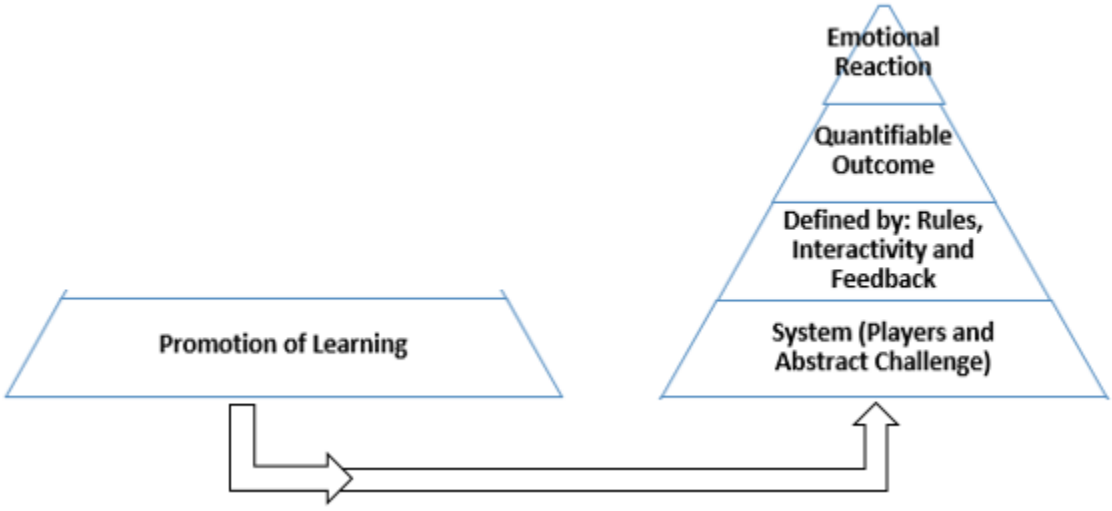

Figure 2. Gamification: Incorporation of Additional Element

The promotion of learning is observed as an element of gamification that complements the existing structure of a game. As a result, gamification becomes integrated in the educational

setting. Multiple studies (Kapp, 2016; Perdue, 2016; Wiggins, 2018) have proven gamification to be effective in different educational and business settings. For example, Kapp (2016) found that the use of gamification with technology is successful when it is learner-centered and certain guidelines are in place; while Perdue (2016) observed the successes of increasing motivation through gamification as it is applied to technology, game theory and game design. As a result, researchers have assigned deeper meanings of gamification based upon the context in which it is applied. An in-depth understanding of the diversity in gamification can be achieved by examining the breakdown of game-like mechanics, game aesthetics, and game thinking, particularly as it relates to educational settings (Ceker & Özdaml, 2017). In the literature to follow, structural and content gamification will be explored to assist in defining the parameters of the study. This will ensure that participants are speaking to gamification, while maintaining their perception of the innovation and its implementation.

Structural gamification. Structural gamification is defined as the "application" of mechanics that individuals use to learn skills without altering the content (Kapp, 2016, p.137). It focuses on specific game elements, such as points, levels, challenges and badges that can be incorporated into a curriculum without modification to established learning objectives. Teachers would select the standard(s) of focus and design learning experiences that assist students in connecting current and new knowledge. For example, a set of math questions can be used in a quiz game. During the game, students would earn points for each correct answer or problem solved. Badges could be given to different positive behaviors displayed during the game. In a structural gamification situation, a teacher creates a game using the standard curriculum and the student earns points or badges when an assignment or problem is successfully completed.

Content gamification. Content gamification, on the other hand, enables teachers to create learning objectives that integrate mathematics content into "story, mystery and characters" (Kapp, 2016, p.138). It allows teachers to incorporate a whole new meaning to the content they are in charge of delivering. For example, a storyline could be prepared that inserts mathematics problems into each stage of the story in a way that makes the mathematics relevant and meaningful to the student. As students read through the story and solve mathematics problems, they can earn points after each stage is completed successfully. Games can be created based on feedback from student surveys that are conducted to gain knowledge of students' backgrounds, prior knowledge, and interests. In this situation, teachers can focus on specific content that students may not have yet mastered and apply content gamification to support learning and understanding.

In summary, gamification is a process that uses elements of a game to provide a different experience to learning a concept. It has been established that a system of elements must be present for gamification to transpire. This does not mean that a required number of elements must be present. Although there are different subsets to gamification, the end result still engages students in a manner that increases and/or reinforces their academic capacity. The next chapter will create a voice to literature that constructs a premise for the use of gamification and reveal foundational components that establish guidelines for its use.

CHAPTER 2: LITERATURE REVIEW

The literature review is used as a foundation for analyzing current literature and gaps of knowledge that lie within. This process gives the ability to better formulate research questions related to themes that have surfaced. Creswell (2014) suggests that the review of literature can be made separately to emphasize findings and reiterate why key words and terms are linked to the concept in question. As schools continue to go into session each year, math educators will want to find better ways to engage their students. Questions may come about regarding gamification (or an application of it) and teachers will want to know if the mentioned phenomenon yielded positive results. Gamification research will be considered and examined by educators for new perspectives along with ideas for implementation and maintenance. Studies can vary in participants, research questions, methodology and worldview. However, the expedition in obtaining more evidence about a topic remains the same—that is, to situate one's own research within prior and existing research while revealing existing literature gaps and making contributions to the problem being studied (Fink, 2005). In the literature review that follows, I will provide background information on the use of gamification as it relates to beliefs about its use in the mathematics classroom, techniques, curriculum design, motivation, and use in assessment.

Literature Regarding Mathematical Principles/Practices

Gamification has been explained previously as a method that teachers can use to help students maintain and/or gain a better understanding of a skill. Leaders in mathematics education agree that "too many teachers have limited access to instructional materials, tools and technology that they need" (NCTM, 2014, p. 3). As a result, schools compete with technology and games to engage students without the loss of an in-depth relevant learning experience. Innovative

methods related to the use of technology and gamification have been making their rounds to assist in making learning relevant and fun. Unfortunately, they may be missing key components that ensures students are using mathematical skills effective and efficiently. To ensure that the best environment for learning mathematics is prevalent, the following components should be in place:

Productive beliefs. A belief that it is possible to learn mathematics must be in place so that students are not afraid to be risk takers. Students have to know that multiple strategies are available to them and that they are allowed to think of what would be the most appropriate. Regardless of method, students should be "appropriately challenged" and "encouraged to persevere" in solving problems (NCTM, 2014, p. 11). The implementation of a practice would be more likely to be effective when a belief from the student and teacher is evident.

Good questioning techniques. The types of questions asked by teachers can force students to acquire a deeper understanding and provide them an opportunity to engage in productive struggle or enable students to make connections between prior knowledge and new learning. Questioning can also cause students to crash and refrain from risk taking. Teachers must stay actively engaged in the questioning process. Questions must be "intentional", "build upon student thinking" and complemented with "time that allows them to formulate and offer a response" (NCTM, 2014, p. 41). Questions should be aligned with the mathematical practices in ways that push students to construct and communicate their own viable arguments as well as critique the reasoning of other students engaged in the learning process. As teachers are utilizing questioning techniques, students are expected to think about what is being asked and justify their

answer. The accuracy of an answer is irrelevant to understanding a student's thinking process. In conclusion, asking the right questions will build a group of students that are mathematically intuitive and driven to expand upon their academic abilities.

The use of these practices and others (mentioned later in the text) will strengthen a teacher's ability to effectively provide a sound mathematics lesson. As I delve deeper into the literature, additional characteristics will be mentioned that aid in the successful implementation of gamification within a mathematics program.

Gamification and Curriculum Design

Most states have a curriculum that has been designed for use in each content area (Common Core, 2010). Gamification is not an innovation that suggests what should be taught. It consists of elements that enhance the learning experience without the alteration of what skills should be taught. As a precaution, the researcher should remember that a math curriculum (regardless of state) should "engage students" with discussions that are situated in math that is "meaningful" and develops procedural fluency through "conceptual understanding" (NCTM, 2014, p.73).

Reinforces Constructivism in the Classroom

Within the confines of the classroom, there are students with mixed abilities and mindsets. In a constructivist's classroom setting, teachers plan opportunities for students to build upon their prior knowledge and connect it to new learning. Amineh & Asl (2015) explain how teachers should focus their teaching using a constructivist's worldview: "Constructivism describes the way that the students can make sense of the material and also how the materials can be taught effectively" (p. 9). Teachers have a unique opportunity to create experiences for

students that will engage them and increase their current level of understanding. Gamification, as it relates to constructivism, is used as a platform to enhance educational experiences that help engage students in hands-on student-centered activities that will enable them to construct knowledge and further their current understanding. The more challenging a game becomes, the more an individual is required to access prior knowledge to develop a new meaning (Kapp, 2012). As students answer questions in a game, some form of feedback is received which students can then reflect upon before moving forward. The teacher is the leader in determining how and what students learn through the learning objectives or situation that is created (NCTM, 2014). It is in this learning environment that students have an opportunity to gain a deeper understanding of the content that is being taught.

Gamification's Effect on Motivation and Engagement

Designing a game that is engaging and fun will allow learners to become immersed in the content that the game delivers. Kapp (2012) suggests that engagement and motivation are one of many main factors that play into successful gamification. When game elements are incorporated into content, "intrinsic and extrinsic motivation" can be observed and supports overall participation (p.52). Intrinsic motivation is best seen when an individual does something for the benefit of understanding. Unlike intrinsic motivation, extrinsic motivation is viewed as participating in a game to avoid consequence or gain something of value. Students often gravitate to this type of motivation but extrinsic motivation does not have long-lasting effects. When developing a game, both types of motivation can be present during an episode of gamification. Extrinsic motivation should not supersede intrinsic motivation because of the negative connotation it has on the perception of learning (Kapp, 2012). Teachers can use both types of motivation to encourage student participation, engage students in deeper mathematics

understanding, and hold students accountable during the learning process. Teachers can use the results of this study to gain a better understanding of gamification and utilize the strategy within their classroom setting to motivate students and support learning.

Gamification Encourages Cooperative Learning

As an integral part of preparing students for the future workforce, educators must develop them to be problem solvers and work cooperatively in groups. In doing so, it's important that teachers design opportunities for students to construct viable arguments and critique the reasoning of others during collaborative group-work (Common Core Standards Initiative [CCSI], 2010; NCTM, 2014). Opportunities include determining if a method to solving a problem was the most efficient way to do so. There is an expectation of students in a mathematics classroom to engage in academic discourse and assist others if misconceptions exist (Capar & Tarim, 2015; NCTM, 2014). Mathematics content lends itself to the concept of reasoning and proof in addition to justifying solution methods used to approach or solve a given problem. Since gamification is structured in a manner that could promote cooperative learning; students will engage mathematics in a manner that builds teamwork, problem-solving skills, and an ability to construct and justify arguments, as needed for local and global competitiveness. This example of effective cooperative learning can branch to other areas like teaching mathematics through social justice. Teachers are also able to facilitate a conversation related to their desired topic, which will serve as a classroom management mechanism.

Gaming and Student Assessment

Teachers are often required to assess their students to determine how to differentiate content, process, product, or learning environment (Tomlinson, 2014). The process by which

they assess is equally important because it helps inform a teacher's next steps. When implemented with fidelity, formative assessment can "find out where learners are in their learning, find out where they are going and find out how to get there" (Wiliam, 2011, p.45). When content is combined with a gamified environment or mechanism, students are able to receive immediate feedback on incorrect solutions. Teachers could then address differentiation by process so that students are able to obtain guidance and support when they have misunderstandings. In return, students could then build upon their current knowledge and gain new insight for increased student achievement, which is an additional form of assessment. Students should also be "self-assessors" where they are able to review their own work and determine what they can do to increase their ability to solve problems (NCTM, 2014, p.95).

Since interactivity is an integral part of gamification, students can be also be used as "instructional resources for one another" (Wiliam, 2011, p.46). Interactivity alleviates some of the pressure for teachers to address each student's needs every day, as gamification is a form of formative assessment that provides students with immediate feedback. However, this form of gamification and assessment should not substitute the instructional support, authority, responsibility and expectations of a teacher.

Gamification as an Information Tool for Teachers and Educational Leaders

Teachers are at the heart and soul of the classroom. They are responsible for ensuring that students are learning. Leaders in education ensure that a school is guided in a direction that best develops student success. This is where perspective plays an important role in the proposed case study. Teachers have the ability to immerse themselves in a study that pertains to them and gather valuable insight to the effectiveness of gamification (Palys, 2008). As a result, teachers

will review the way instructional techniques are implemented to maximize the success of putting an innovation to practice.

A component of gamification is used to prepare students to solve problems (Kapp, 2012). Games can be highly competitive and confirming that engagement is prevalent is one of many essential foundations to the success of its implementation. Problem solving has long been a caveat of teaching and learning mathematics. It is at the heart of understanding how mathematics works in the world for people. Polya and Sloan (2009) reiterate a need for a process to problem solve in mathematics, which can lend itself to the mentioned component of gamification. As a result of becoming problem solvers, students become more aware of the type of problem being asked and concentrate on the most appropriate strategy to quickly answer them.

Teacher Perception

Teacher perception will be an intricate component of the proposed study as it relates to gamification in the mathematics classroom. It is one of the main research questions and therefore, must be addressed in how the researcher will approach the study. Sanchez-Mena and Marti-Parreno (2017) were addressed earlier regarding their phenomenological study in describing barriers and drivers for the implementation of gamification. Through a qualitative study, the researchers were able to gain a better understanding of how teachers felt about gamification. The study was conducted based upon a relatively small number of participants (16 individuals). Even though a small number of participants are used, data saturation could still occur after collection and analysis (Patton, 2002). Although Meredith (2016) describes some concepts that professional development will help address teachers' needs in the area of gamification, more is to be learned in how teachers can play a vital role in creation, implementation and review of the gamification structure.

Sanchez-Mena and Marti-Parreno (2017) also had participants that teach at the collegiate level. As stated previously, there is hope that vertical alignment is positive when the viewpoint of perception is observed in the middle school setting. The questions used in their study will prove useful in addressing questions about perception. One of the main research questions posed was: "Which are the main drivers…" and "…barriers that teachers serving in Higher education institutions find when using gamification in their courses?" (p.436). A thematic analysis took place regarding the word frequency for barriers and drivers of gamification. In the proposed study, a similar analysis will be used to show linearity between themes and how they fit in the eventual findings. Similar to the Sanchez and Marti-Parreno's study, there is an agreement that the study does have a constructivist approach to student learning through gamification. In return, teachers will inform their perception based upon what is used to design the game and how students react to gamification. It will continue to be an approach that is addressed in this study.

Successes in Implementation

Gamification has seen its success throughout many of the studies conducted (Gregg-Harrison & Anderson, 2014; Stott & Neustaedter, 2013). It is the reason why some researchers are interested in developing their own study. Harrison and Anderson (2014) created a game for mobile devices for students who were learning how to perform mathematical induction. Many of the elements used in the app directly related to the definition the researcher is using like engagement, strategy and engaging people (befriend). The game the authors implemented also uses a scoreboard and introduces rewards for the students that advance on the leaderboard. Stott and Neustaedter (2013) completed an analysis on gamification based upon the literature analyzed. The study found that when "storytelling, rapid feedback, progression and freedom to fail" (p.1) are integrated through the learning environment, gamification proves to be a more

effective resource for student learning. Each study was reviewed to observe if they qualified as incorporating the mentioned elements. The educational setting lends itself to allowing an easier transition to incorporate game mechanics.

Challenges in Classroom Implementation

Although success has been observed through the use of gamification, some serious challenges have come about through research. In the case study presented by Ross (2013), he wanted to see if the proposed innovation would work for at-risk students at a selected high school. Within the completion of the study is a variable that describes the type of children who participated in Ross' research study. Ross mentions that some of the students come with a few of the following issues: "work avoidance, school avoidance, acting out in class, poor relationships with school personnel and a reluctance to work independently" (p.1). This study provides evidence for how gamification could work for a teacher when certain challenges are present.

In gamification, points are one of many elements that make up a game (Kapp, 2012). The students in Ross' study were introduced to "MathLand" where they completed levels to earn points. Students who engage in gamification during the learning process have shown success on high-stakes assessments (McIntosh, 2019). However, there are some serious drawbacks reported by teachers as it relates to difficulties associated with the creation of a game and the incorporation of gamification into lesson planning. Some of the drawbacks mentioned were "advanced planning was required, teaching may feel more repetitive, and an increase in record keeping" (Ross, 2013, p.4). Fortunately, there are some remedies to address the concerns that Ross had in his case study. Gamification does not have to be done in isolation. Teachers can use "content gamification" which was illustrated in Ross' study or they can utilize "structural gamification" (Kapp, 2016, p.137). Different methods of implementation bring about various

outcomes that can determine the impact of gamification. A discussion could take place among teachers to determine best practices, co-plan lessons, and discuss student-learning outcomes to provide collaborative support.

The downfall to many of the studies presented in the literature review is that they lack relevance to the researcher's proposed topic. Although they provide unique scenarios to learning, the studies do not align with teachers and the use of gamification in the middle school setting. The literature presented in this section can lend to ways gamification can be attempted in the middle grades setting. Stott and Neustaedter (2013) used a study of their own in comparison to similar studies completed. The use of a multi-case study analysis demonstrates that the researchers wanted to theoretically connect the use of games in different contexts. It allowed them to observe and understand gamification in multiple settings (Turner, 2010).

As this study continues to take shape, it is essential that the researcher develop a blueprint that assembles participants, collects and analyzes data and interprets results. In return, the results of the study can be used to inform future research. Chapter 3 thoroughly examines the methodology used to implement the researcher's qualitative study.

CHAPTER 3: METHODOLOGY

The researcher must be aware of how their study is informed by the past and how it plays a role in informing future researchers. With respect to mathematics teaching and learning, this study provided additional knowledge for educators that will assist in understanding how gamification can be used in a middle school classroom to motivate students' mathematics learning and understanding. The literature review provided a foundation for analyzing current gaps in gamification knowledge. Each year, math educators continue to search for better ways to engage students. This study could be of interest to educators who are searching for new perspectives and ideas for implementation of gaming in their classrooms to motivate students and maintain student engagement during lessons.

The aim of this study was to investigate and determine a) what are the benefits and challenges to implementing gamification in the mathematics classroom and b) what are the perceptions of mathematics teachers when elements of gamification are in use in the classroom. Qualitative methods of data collection were used during the investigation. Open-ended questions were presented to provide participants an opportunity to reflect upon their prior understanding of gamification and any new knowledge gained from implementation including: defining gamification and determining if they observed the innovation as a benefit/challenge. The researcher interpreted participants' meanings to determine their perceptions of the benefits/challenges to implementing gamification in middle-grades mathematics classrooms.

Research Design

The mechanisms that describe how a study will be conducted is essential to effectively address the research questions posed. They included an understanding of the participants,

detailing reasons as to why the study occurred, the type of approach used (illustrative, descriptive, theory testing, etc.) and what processes were embraced (Cohen, Manion & Morrison, 2018). For this study, I built a case study design using the following definition as a foundation: "A case study provides a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply presenting them with abstract theories or principles (p. 376)."

Because case studies are built upon the construction of knowledge, using a case study approach enabled the researcher to achieve a better understanding of the benefits and challenges of implementing gamification during the learning process in the middle-grades mathematics setting. Furthermore, my interest in gaining insight into mathematics teachers' perceptions of gamification in a middle school mathematics classroom setting supports the use of a qualitative case study. I used a theory based upon gamification to inquire about perceptions, benefits, challenges and other factors that are present within the innovation's implementation.

The qualitative case study approach helped drive the type of questions asked, how data was collected and steps completed for data analysis. The questions in this study were open-ended and directly related to the research (Creswell, 2013). In addition to open-ended interview questions, journal entries were used to support claims made in the findings and to validate qualitative measures during the study. Figure 3 depicts the framework used to address the requirement for a structure that assisted in eliminating potential bias in the execution of the study.

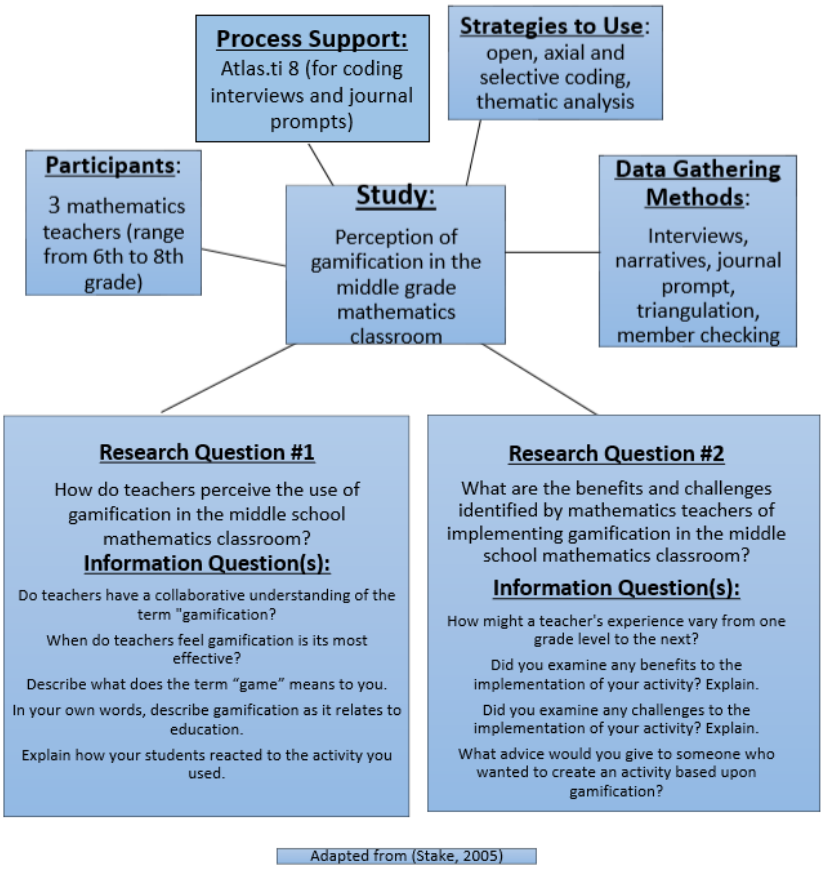

Figure 3. Case Study Framework

Data Collection Methods

Data collection can become very arduous work if the researcher does not develop a plan. Creswell (2013) recommends a process that can be used to ensure that data is collected in an ethical manner and that your research design is not compromised with bias. Figure 4 is a graphical representation of the data collection process. Each component of the circle is explained in the following paragraphs.

Figure 4. Data Collection Circle. Adapted from (Creswell, 2013, p.146)

Locating the site/individuals. Individuals from three Southern U.S. middle schools consented to participate in the study. The middle school sites were conducive to conduct a study on gamification in mathematics since students and teachers were present. Formal consent (through physical signed documentation) was acquired for three teachers. The Individual Consent Form document (Appendix A) provided detail to the purpose, components of the study, risk, benefits and confidentiality of participants.

Gaining access and making rapport. After IRB approval was acquired through Kennesaw State and the collaborating school district, an initial letter was sent to the principal of each school asking for permission to locate individuals within their building to participate. This process was completed as a courtesy and to help establish rapport with each school's leadership for future considerations of research at that and other sites. The consent form (Appendix A) addressed the guidelines of the study and gave indication to how participants were valued from the researcher's perspective. Participants must feel an established level of trust so that the research can obtain as much valuable information as possible (Turner, 2010). Providing the

participants with all pertinent information at the beginning of the study allowed them to make an informed decision regarding their participation. In return, they showed interest and I was able to establish rapport with my participants.

Purposefully sampling. Defined earlier in this study, purposeful sampling or stakeholder sampling acquires participants who have concern in the matter being investigated (Palys, 2008). Three individuals were acquired to participate in the study. The individuals that participated in the study were: a) middle-grade teachers of mathematics, b) individuals who had an interest in the proposed topic and c) had students that can be used to help participants gather information regarding their perceptions of gamification. Maximum variation was considered given that participants came from different middle-grade levels and ranged in age, years of experience and education.

Collecting data. Collecting data is a task that is very important to the validity of the data itself. The researcher collected data from three sources: two one-on-one interviews (pre and post-implementation), and a journal writing entry.

1) The one-on-one interviews were semi-structured where the researcher used a set list of questions (Appendix B, D), but asked follow-up questions to add clarity to participants' assertions. The format of the interview was presented face-to face or using video conferencing software. The formats chosen allowed participants easier accessibility to partake in the interview process. Participants were also allowed to make any additional comments during the interview, which was recorded on Appendix C and E. All instruments used were shared with participants for openness and transparency. The interviews were intimate and provided the researcher an opportunity to collect rich,

descriptive data from the participants' perspective. It will be used to address the research questions regarding teacher perception and benefits and challenges of implementation of gamification. After all the participants' information was recorded, the researcher expressed thanks for their time.

2) The participants used a journal prompt (Appendix G) in order to give description of their process for implementing the proposed innovation. The journal prompt was sent to each participant electronically. Once the journal prompt was completed, participants submitted either a PDF version or a printed copy of their product. This helps in the validation of authentic work samples. Any information linking the journal to individuals was removed. The journal prompt displayed authenticity and helped establish trustworthiness between the audience and researcher for the research question regarding teacher perception. As a supplement, journal data collected would be analyzed for solutions to the second research question exploring benefits and challenges of the implementation of gamification.

Recording information. The one-on-one interviews were audio recorded. The recording sheets containing the initial interview questions (Appendices C & E) were used to assist with recording participants' responses. It also served as a useful instrument for recording additional comments made during each interview. Creswell (2014) states that having a protocol in place is essential to proper recording of information and should include a script to stay on track with the purpose. Once the participants' information was recorded, the researcher expressed thanks for their time.

Resolving field issues. The researcher ensured that the proposed research design that was implemented. The schools selected based upon its ease of access and good rapport established with school leadership. Interviews were conducted where the researcher listened actively and asked follow-up questions when necessary. No confidential information collected during the study was shared with other individuals.

Storing data. There were multiple options that could be used to ensure the proper storage and safety of data. The researcher used an online hard drive that stored and secured information such as: documents, recordings, etc. After the data was analyzed, the online hard drive was cleared of any information related to the study. As a backup and precaution, a portable hard drive was used and secured in a locked desk in the researcher's office after use.

Participants. The researcher's theoretical sample comprised of individuals participating from a public middle school located in southeast region of the United States. The schools followed a curriculum that is parallel to the Common Core Standards for Mathematics. Patton (1990) (as cited in Statistics Solution, 2018) suggested that a "qualitative sample size may best be determined by the time allotted, resources available, and study objectives". The proposed sample size of three would allow the researcher to collect and analyze data in a timely manner with minimal, yet optimal resources utilized.

For this study, participants were selected using purposeful sampling. Purposeful or purposive sampling is the process of identifying cases that are "information rich" given the limited availability of resources (Palinkas et al., 2015, p. 534). Through purposeful sampling, the researcher gained information from teachers with prior knowledge of the mathematics curriculum and any experiences they had in relation to gamification and its application in the

classroom. The table below provides information about each participant that was useful in the analysis of the study.

Table 2

Participant Demographics

Participant Pseudonym	Approximate Age	Race	Current Education Level	Years of Teaching Experience	Grade Level Currently Teaching
Josephine	Early 30's	Black	Bachelors	2 years	6th
Joe	Early 60's	White	Masters	1 year	7th
Tonya	Late 50's	Black	Specialist	18 years	8th

Since each research question addressed an application of mathematics teaching and learning, each individual participating in the study held a state teaching certificate in middle grades or secondary mathematics. Finally, participants in the study varied in education, grade level, experience and familiarity with gamification. The researcher considered conditions that will increase the likelihood of having different viewpoints so that future recommendations for studies can be better informed.

Data Analysis

Clarke and Braun (2013) determined that an analysis should occur through a process that reviews data, codes it, find themes within the codes, reviews, defines and names themes. The qualitative study in question acquired points of data from an initial and final one-on-one interview and a journal prompt. The data was analyzed using a grounded theory approach. Grounded theory is a qualitative research methodology developed by Berney Glaser and Anselm Strauss where "the researcher uses multiple stages of collecting, refining and categorizing data" (Kolb, 2012, p.83). The data was coded and analyzed using Atlas.ti 8 software(2017). The

mentioned software was used to observe all transcribed data and organized the text into codes. Figures created from the analysis proved beneficial in further illuminating themes. The codes were then further integrated into groups and themes for final analysis. There were three levels of analysis that took place to theoretically ground the data collected:

Open Coding. Open coding was used to review the data points several times for accuracy. The data was read for its literal value and not used to discover new meaning yet. Words and statements were reviewed from the one-on-one interviews and the journal entry to determine what codes are prevalent. Codes were created (Kolb, 2012) based on the participants' descriptions of any benefits to implementing gamification in the mathematics classroom and their perceptions of students' motivation and mathematics understanding.

Axial Coding. Axial coding is the process of taking the open codes and categorizing them into groups that are connected or related. Some codes may belong to multiple groups depending upon how the researcher categorized or connected them. By relating "subcategories (labels) to a larger category, theoretical development became a close reality through continually asking questions and making comparisons" (Kolb, 2012, p. 84).

Selective Coding. Selective coding is the final stage that was performed before an "emergence of grounded theory" occurred (p.84). At this point, all categories were analyzed to become part of an overall theme or core category. The themes related to the research questions were noted. The axial codes were organized and review of the previous codes took place to ensure that they were in the appropriate core category.

In the process of coding, a constant comparative method was used to code the data when the researcher collected data points. This ensured that impending data was coded in the same manner as it was previously (Kolb, 2012). There were some instances where data did not fit into any previous category created and a new one was generated. As data was coded from each participant, the categories produced were reviewed to validate the need for a new category.

The process of coding described above provided a systematic method for answering the research questions using a valid, research-based technique. The methodology proposed was not a rigid system but was fluid and flexible in its approach. Grounded theory enabled initial collection, grouping and regrouping of data to take place (Kolb, 2012). It also validated the need to carefully collect and analyze data so that bias is not an issue to the community with whom the results will be meaningful and useful to.

Trustworthiness and Bias

For the researcher, steps were taken to ensure that the study was conducted with the highest level of confidence. A variety of strategies were used to maintain the credibility of the researcher. Guba (1985; as cited by Iivari (2018)) utilized a method called member checking which allows participants to validate the transcription and interpretation of a conversation. It is not mandatory for a participant to complete a “member check” but it allows them to guarantee the researcher is interpreting their viewpoint accurately. Therefore, encouraging the participant to complete a check would be helpful in establishing validity and credibility. Triangulation was used as a method to ensure there is a connection between all data collected. The study produced two interview transcripts and one journal entry. The questions within the interviews and journal prompt were the same for each participant so that the analysis showed comparability.

Validity was established by using finite parameters to conduct the study. For this case study, a maximum amount of time has been established for implementation. Purposeful sampling was established as a method for finding participants that will most likely provide valuable data for the study. The researcher has an interest in gamification and was a former middle grades mathematics teacher. This may have caused a concern for bias in the collection of qualitative data. Therefore, open-ended questions were selected for participants to answer in a manner that did not restrict their voices. These types of questions gave participants the ability to describe settings using detailed or thick descriptions. Other researchers can replicate the study because a detailed explanation of the methodology process is included in earlier parts of chapter three.

Study Limitations

Regardless of a study being quantitative or qualitative in nature, the researcher must be aware of the limitations that exist. A qualitative study seeks to "evaluate the complexity and ensure that the conclusion take account of both unique and general factors" (Atieno, 2009, p.13). However, the researcher acknowledged that a small number of participants posed a threat in attempting to generalize for a population. In this case study, middle-grade math teachers were used as participants. This was not representative of teachers in elementary, high school or post-secondary settings. With these concerns in mind, the researcher was still hopeful in gathering and analyzing data that is informative, thematic and representative of the experience participants engaged in.

In this chapter, the researcher's approach, research design, and process for conducting the study was established. It included an assortment of techniques for data collection, analysis procedures and information regarding participants. Collectively, these parts combined to formally conduct a study that shows reliability, validity, transferability and confirmability

(Lincoln & Guba, 1985). Chapter four will be used as a platform to present the findings of this study.

CHAPTER 4: FINDINGS

This chapter will address the results of the qualitative study as specified by the methodology in Chapter three. The purpose of the study was to understand mathematics teachers' perception of gamification and explore any benefits and challenges to its implementation. The data collected will explore solutions to the following research questions:

1. How do teachers perceive the use of gamification in the middle school mathematics classroom?
2. What are the benefits and challenges identified by mathematics teachers of implementing gamification in the middle school mathematics classroom?

The research questions addressed a need to determine if middle-grade mathematics teachers implementing gamification have similar benefits and challenges to those in elementary, high school and beyond. The researcher's need to conduct research was established based upon the lack of evidence pertaining to the research questions at the middle school level, explained in Chapter 1. Meyrick (2006) defines a good qualitative study as one that describes participants fully, is organized, and has an evidence-based connection between the research questions and the data itself.

Sample

There were three individuals that participated in the qualitative study. Each participant was verified to having taught the grade level indicated and are current, certified, middle-grade mathematics teachers by the Georgia Professional Standards Commission (GAPSC). Table 2 (below) shows the participants' demographic information. The participants' demographic

information falls in line with the purposeful sampling method, obtaining a math teacher from each grade level with varying degrees of education and experience.

Table 2

Participant Demographics

Participant Pseudonym	Approximate Age	Race	Current Education Level	Years of Teaching Experience	Grade Level Currently Teaching
Josephine	Early 30's	Black	Bachelors	2 years	6th
Joe	Early 60's	White	Masters	1 year	7th
Tonya	Late 50's	Black	Specialist	18 years	8th

Two of the three teachers were still in an induction phase (less than 3 years) of their career (McDonald, as cited in Jones, 2017).

The qualitative research within this study follows guiding principles of grounded theory to ensure that it shows reliability, validity, transferability and confirmability (Lincoln & Guba, 1985). The researcher must maintain the voice of the participants so that rich descriptions of their perspective are protected. The study was segmented into phases to create a system for constant comparative analysis. The analysis occurred over a total of three phases: Pre-Implementation, During Implementation and Post-Implementation. Two phases (Pre and Post Implementation) required participants to participate in a one-on-one interview while a journal prompt was used for the middle phase (During Implementation). For each phase of the study, data was coded and themed using the Atlas.ti 8 (2017) system. The program assists the researcher in the data analysis process by assigning codes to discover emerging themes within the data collected. As a result, snowflake-shaped figures can be created to help visualize the participants and their responses to questions asked in the study. It also attests to the inclusion of participants' voice within the

analysis. Figures 5, 6 and 7 (below) are included to give a visual representation to readers of the structures created.

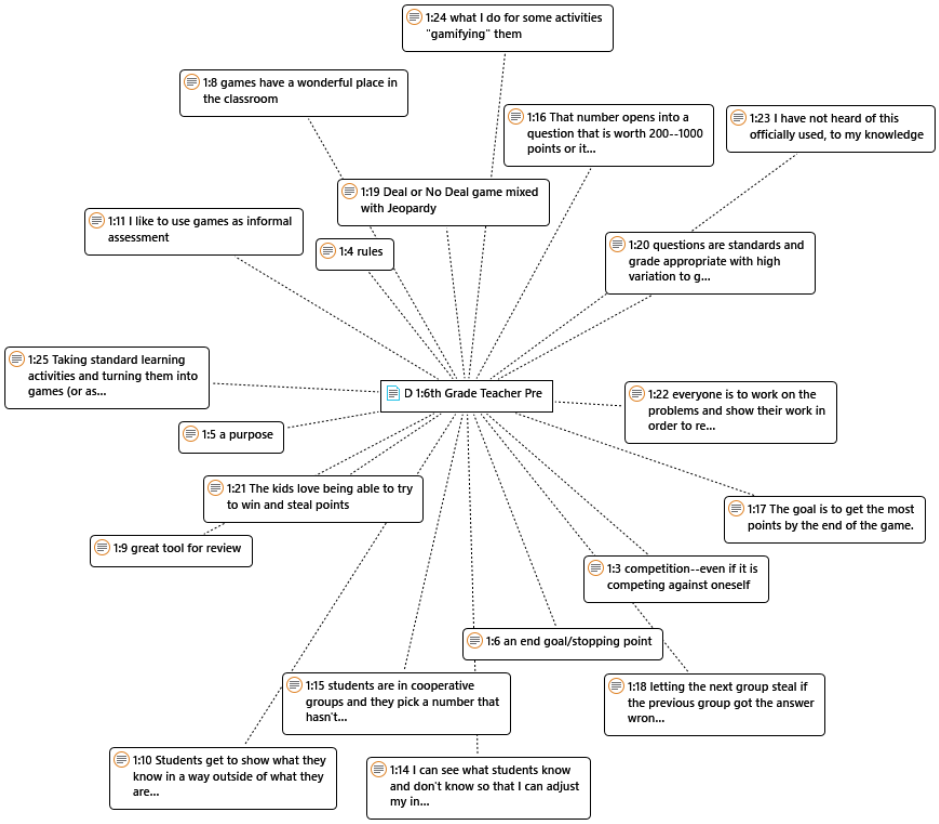

Figure 5. Participant 1 (6th Grade) Responses (ATLAS.ti 8)

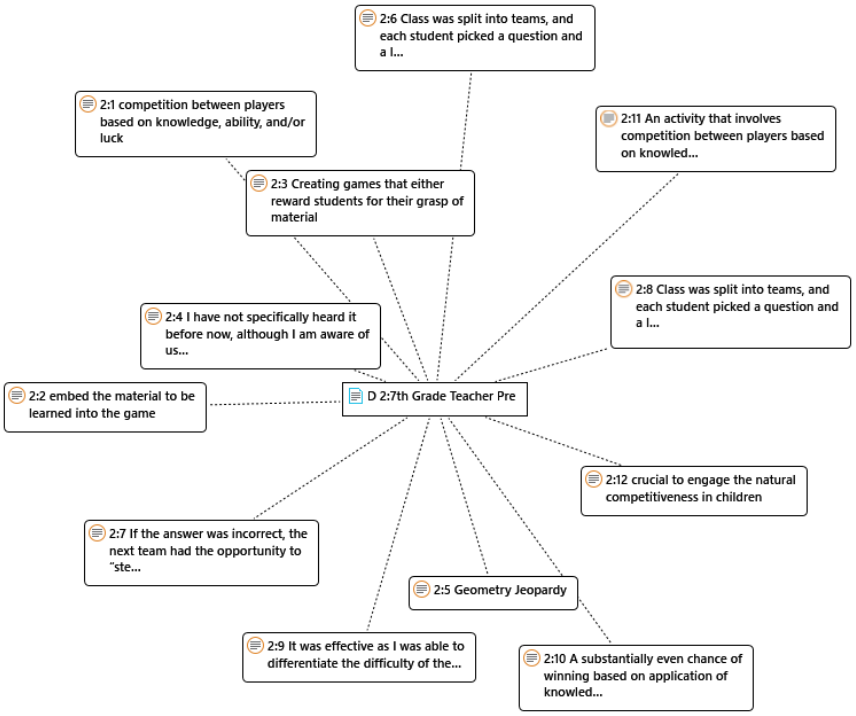

Figure 6. Participant 2 (7th Grade) Responses (ATLAS.ti 8)

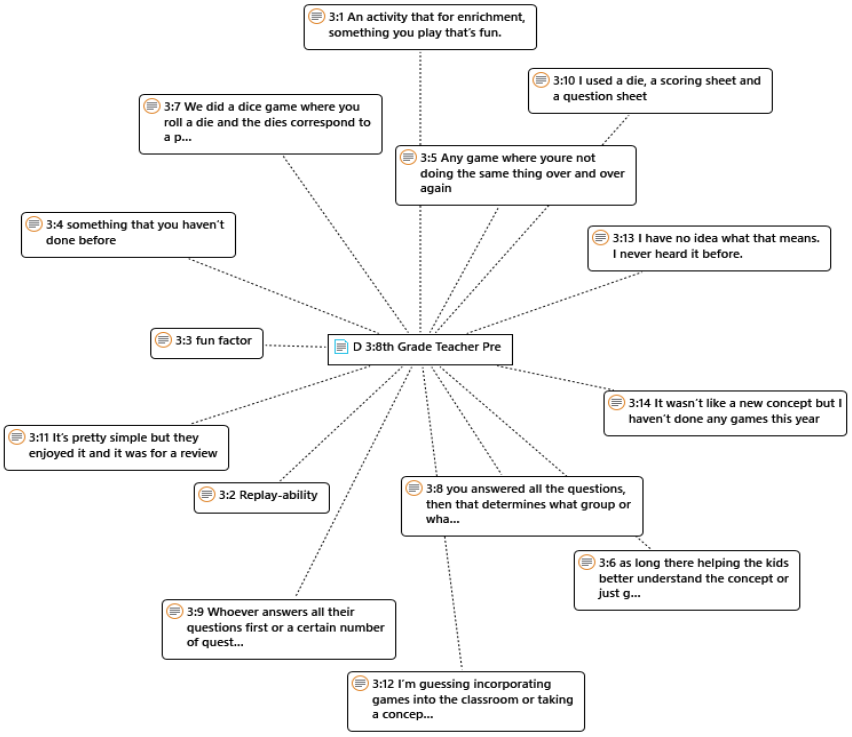

Figure 7. Participant 3 (8th Grade) Responses (ATLAS.ti 8)

Pre-Implementation Phase

During the Pre-Implementation phase, participants were asked questions regarding their background knowledge of gamification and their recollection of games. Tables 3,4 and 5 show the codes that emerged from analysis of each one-on-one interview. The tables provides support for how participants answered the interview questions.

Josephine (6th grade teacher). The following definition was derived from Josephine when asked about gamification: “I like to call what I do for some activities "gamifying" them, so I am sure that it's on the same level... Taking standard learning activities and turning them into games (or aspects of them into games)”. Josephine took the term “gamification” and had a very descriptive picture of its meaning.

Table 3

6th Grade Teacher - Codes Used and Frequency for One-on-One Interviews (Pre-Implementation)

Codes	Frequency (times mentioned)
Adaptation of Game(s)	1
Alternative method	1
Characteristic	1
Competition	0
Emotion	1
Game defined	1
Gamification	2
Gamify	2
Goal	1
How games can be used	1
Points	1
Positive comment for use of games	3
Rules	3
Unfamiliar with terms	1
Total	19

Her interpretation included a reference to games and applying it to math standards addressed within the classroom setting. When asked about familiarity with gamification she stated: “I have not heard of this officially used, to my knowledge”. Josephine has a basic understanding of the meaning of gamification even though, she had never heard the term before.

She goes into detail discussing her stance on games in the classroom. Josephine states that games have a “wonderful” place within the classroom setting. She has a positive viewpoint of the use of games in the classroom. Additional steps are taken to describe how games can be used as “an informal assessment” to “see what students know and don’t know”. Josephine mentions that she would adjust the instruction in her classroom once the assessment has taken place. Things that students are using every day are not included in the makeup of a game. “Students get to show what they know in a way outside of what they are used to everyday--such as pencil and paper”.

When asked about describing the word “game”, Josephine thinks of “competition”. She includes the following: “even if it is competing against oneself”. She describes a game as being challenging regardless of how many players there are, even if you are the only player. A game was described that Josephine bought previously called ZONK! coordinate plane. The rules of the game are intricate including: picking “a number that hasn't been selected yet on the game board”, “letting the next group steal if the previous group got the answer wrong” and having a “goal… to get the most points by the end of the game”. Although no work had to be put into the creation of a game, Josephine had an idea of what she perceived an educational game should look like and modified it to make it more interesting. She stated that: “The kids love being able to try to win and steal points, so everyone is to work on the problems and show their work in

order to receive credit for the game". She has a strong belief about the use of games in the classroom and has seen it has value because students get a lot of practice problems in.

Joe (7th grade teacher). The following definition was derived from Joe when asked about gamification: "Creating games that either reward students for their grasp of material or embed the material to be learned into the game." Joe also had vivid explanation for what he thought gamification meant. Games are created with material ("math problems"). His definition seeped into one of two types of gamification described by Kapp (2016), content gamification. This type of gamification was defined for participants in the second phase of the study.

Table 4

7th Grade Teacher - Codes Used and Frequency for One-on-One Interviews (Pre-Implementation)

Codes	Frequency (times mentioned)
Adaptation of Game(s)	1
Alternative method	0
Characteristic	1
Competition	1
Emotion	0
Game defined	1
Gamification	2
Gamify	0
Goal	0
How games can be used	1
Points	1
Positive comment for use of games	0
Rules	2
Unfamiliar with terms	1
Total	11

Before defining the term, Joe had not heard of the term previously when asked. His response was: "I have not specifically heard it before now, although I am aware of using games for classroom activities." Joe is also stating that he was aware of the concept but not the term

itself. He also stated his belief that games are essential in the classroom: “I believe it to be crucial to engage the natural competitiveness in children”. Joe’s experience with children has revealed to him that children have a competitive trait and that games can help drive that trait to support its proper use within the classroom setting.

He also inferred that many characteristics are within gamification because of his definition of a game: “An activity that involves competition between players based on knowledge, ability, and/or luck”. Joe has a basic understanding of gamification and is unaware of his surprising connections to its meaning. Joe was also able to describe a time when he used a game in the classroom called “Geometry Jeopardy”. He described the game in detail by providing rules like: “Class was split into teams, and each student picked a question and a level of difficulty and were given points for correct responses”.

Table 5

8th Grade Teacher - Codes Used and Frequency for One-on-One Interviews (Pre-Implementation)

Codes	Frequency (times mentioned)
Adaptation of Game(s)	0
Alternative method	0
Characteristic	0
Competition	0
Emotion	1
Game defined	1
Gamification	1
Gamify	0
Goal	0
How games can be used	2
Points	0
Positive comment for use of games	2
Rules	4
Unfamiliar with terms	1
Total	12

He also spoke to the effectiveness of the game when stating: “It was effective as I was able to differentiate the difficulty of the question based on the capability of the students as evidenced by their class grades”. Joe had experienced some success with games that he played recently and was able to prove it through numerical data from students.

Tonya (8th grade teacher). The following definition was derived from Tonya when asked about gamification: “I’m guessing incorporating games into the classroom or taking a concept and putting a game into it”.

Tonya gives meaning to the term gamification and determines that games are integrated to the classroom setting. She assumes that gamification is achievable when a concept (math standard) is combined. When asked if she ever heard of the term she stated: “I have no idea what that means. I never heard it before”. Tonya is unaware at this point that she has a basic idea of what gamification is. In her years of teaching, she describes the following regarding the use of games in the classroom: “I mean as long there helping the kids better understand the concept or just giving the kids different ways to learn, I’m all for that. Today’s kids can’t do any of the older stuff we used to do. You got to keep inventing stuff to keep their attention and games keep their attention”. Tonya felt like the kids that are currently in school are different than when she was in school and therefore require creative ways to teach them. She notes that some effort must be exerted into ensuring proper game usage in the classroom.

She describes a game as an “activity” that is “fun” and something you can do for “enrichment”. When Tonya was asked about what elements she think are needed to make an effective game, she stated numerous characteristics including “replay-ability and fun-factor”. She says that repetition can be present but if the game is presented differently, it keeps a person engaged throughout its use. Tonya was able to describe a time where she used a game in the

classroom involving dice. There were particular rules like: “roll a die and the dies correspond to a particular question. Once you answered all the questions, then that determines what group or what team wins. Whoever answers all their questions first or a certain number of questions first, then they win. I used a die, a scoring sheet and a question sheet”. She stated that the students enjoyed the game, it was simple to complete and that it was not over a “new concept”. Students did not play a game based upon unfamiliar or newly presented content.

During Implementation Phase

During the implementation phase**,** teachers were asked to think about what standard(s) they would want to use for their game. Once their minds were set on one or a set of standards, teachers would brainstorm to come up with a game to use within their classroom setting. The next part gave them time to design their game and prepare it for use. Pictures were taken to provide a clearer context to the game being used. Finally, teachers were asked to reflect upon their practice with the following prompt:

> In this journal prompt, you will write about the process you went through to create your activity. Explain the design of your activity in detail (e.g. how it works, connection to standard(s), what components of gamification are used, how you know if students learned, etc.). Include a picture of the activity. You can write as much as you want to get your point across. (Appendix G)

Below is each teacher’s response to the journal prompt provided to them: Tables 6, 7 and 8 are used to show codes that emerged from analysis of each journal prompt.

Josephine (6th grade teacher). Josephine expressed her excitement for utilizing games in the classroom. As she processed the steps to complete in the study, the following is mentioned: “I teach mathematics, so modeling and direct instruction is very important, but it is amazing how engaged students are when playing a game”. Josephine established that there are parameters for

when games should be used because of other parts of the instructional framework that should take place. There is still a need for her to want to include games often.

Table 6

6th Grade Teacher - Codes Used and Frequency for Journal Prompt (During Implementation)

Codes	Frequency (times mentioned)
Adaptation of game(s)	0
Challenge	0
Characteristic	1
Competition	2
Emotion	2
Engagement	2
Future consideration for games	3
Game element	0
Gamification	1
How games can be used	8
Points	3
Positive comment for use of games	4
Productive belief	1
Rules	5
Total	32

There are certain situations that have occurred in class where students were not engaged in solving problem. In a game situation, Josephine has realized that her students "brains shake off the cobwebs for the sake of winning". She gained new knowledge regarding gamification and what components it consists of. As a result, the article by Kapp (2016) caused Josephine to be "very intrigued by the example of the game that was discussed in the article and the high levels of differentiation that were possible in such a game". The article mentioned some games that utilized computers and Josephine was wanting to one day provide her students with access so she can see them learning using adaptive technology. This is one of many elements that can be present to provide a gamified experience. Figure 8 is a picture representing the ZONK! game being played.

Figure 8. Participant 1 (6th Grade) – ZONK! Game Picture

The game that Josephine used/created was called ZONK! It covered content associated with understanding the coordinate plane. Another reference to the article was made when she stated that "According to the article, Zonk! Is an example of Structural Gamification. The questions are typical and directly based on the standards, but they are surrounded by game elements, such as earning points, losing points, losing turns, and competition against other teams (leaderboard)". A process for adapting the definition of gamification to her game was evident. Time was taken to ensure that she was able to "review approaches to questions and… see for the individual student where the trouble areas may have been". Students are her focus so that the game is fun, a way to informally assess and cater to their educational interests.

Joe (7th grade teacher). Joe only mentioned what took place when the game was implemented. He stated the following based upon the prompt (Appendix F):

Overall a well-received activity by the students. Most students were engaged although some did little to no work and others copied answers from other teams.

Continuous Improvement Ideas

1) We combined all three classes for one activity. This made facilitation more difficult.
2) Some problems required calculators; not all students had one available.
3) Despite repeated prompts, many students did not replace problems in eggs. (Joe)

Table 7

7th Grade Teacher - Codes Used and Frequency for Journal Prompt (During Implementation)

Codes	Frequency (times mentioned)
Adaptation of game(s)	0
Challenge	4
Characteristic	0
Competition	0
Emotion	0
Engagement	1
Future consideration for games	0
Game element	0
Gamification	0
How games can be used	0
Points	0
Positive comment for use of games	0
Productive belief	0
Rules	0
Total	5

Based upon the information given, Joe had a game he used dealing with opening eggs to look at and solve problems. Some problems required the use of a calculator. Some of the materials needed were paper, pencils, eggs and calculators. Figure 9 shows a picture of students playing the Egg Problem Game.

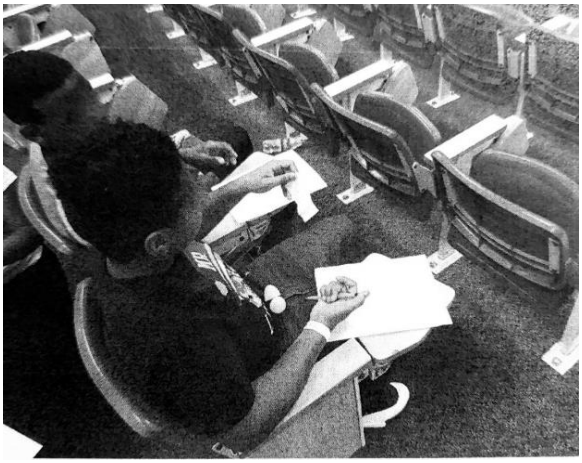

Figure 9. Participant 2 (7th Grade) – Egg Game Picture

Joe knows that some elements are needed to make an effective game. He also described students solved problems from the eggs in teams. Students were engaged in the process for solving math problems. One of the rules was to put the problem back inside the egg when finished. Many of the characteristics Joe listed above are in alignment with elements (rules, teams and learning objective) of gamification.

Tonya (8th grade teacher). Tonya mentioned that her game involved playing a modified version of UNO. Figure 10 captures a moment of the Transversal UNO game while in action.

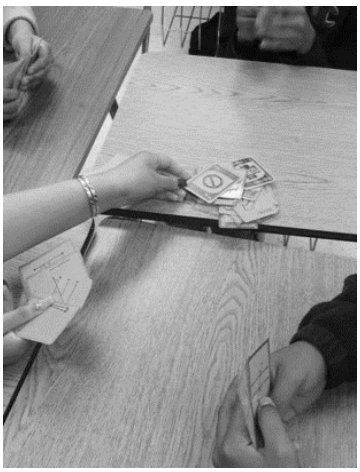

Figure 10. Participant 3 (8th Grade) – Transversal UNO Game Picture

Rules were evident as she told students: “Draw a card to answer a question. If it is correct, you can lay the card down in the pile. If wrong, another player can answer the question to make that person draw a card”. Students were earning points as a mean to win the game. Students were working on angle relationships between parallel lines and a transversal. It was clear that Tonya had a learning objective, rules, materials and points to earn. In her design of the game, she stated that she: “was able to observe who was mastering the standard and who still needed help with understanding”.

Table 8

8th Grade Teacher - Codes Used and Frequency for Journal Prompt (During Implementation)

Codes	Frequency (times mentioned)
Adaptation of game(s)	1
Challenge	0
Characteristic	1
Competition	0
Emotion	0
Engagement	2
Future consideration for games	0
Game element	1
Gamification	0
How games can be used	3
Points	0
Positive comment for use of games	3
Productive belief	1
Rules	3
Total	15

Tonya observed that students were engaged, focused on the content and rules so that they could be the player to win. She also said that: “I know my students learned the standard based on the results of the weekly assessment. The game was a fun and engaging activity to enhance learning in a fun way”. Tonya assessed her students and realized that the games helped them in

understanding angle relationships. This shows her commitment to ensure that the games played have an educational value to them. The final phase will analyze how each teacher reflected as well as determine what themes were common among them.

Post-Implementation Phase

The third phase of implementation related to teachers discussing how they reflected upon the game created. An exploration of benefits and challenges will be determined by the participants' experiences. Tables 9, 10 and 11 are used to show codes that emerged from analysis of each one-on-one interview.

Table 9

6th Grade Teacher - Codes Used and Frequency for One-on-One Interview (After Implementation)

Codes	Frequency (times mentioned)	Codes	Frequency (times mentioned)
Adaptation of game(s)	1	Implementation challenge	1
Characteristic	0	Movement	0
Competition	3	Participant new knowledge	5
Effective	1	Plan and expect	3
Emotion	1	Points	2
Engagement	4	Positive comment for use of games	3
Future consideration for games	0	Productive belief	1
Game element	1	Rules	1
Gamification	1	Transferrable	0
Goal	0	Unfamiliar with term	0
How games can be used	2		
		Total	30

Josephine (6th grade teacher). When asked about defining gamification in her own words, Josephine stated the following: "Gamification in education is where you are taking standards-based instruction and adding in game elements to it. I do remember reading that there

are two types of gamification: there are structural and content". She has adopted a general definition to the term after the implementation of her game. Josephine continues to describe gamification using terms like "characters", "scoring", "levels", "achievement" and "competition". She has an advanced knowledge of what gamification could mean as it relates to education.

Josephine was then asked about her activity. The ZONK! Activity that she modified had a "game show" feel to it. Questions were pulled from the course's textbook and point values were assigned to them. As a part of the game, students were competing against each other in teams. In a question related to the students' reaction to the game, Josephine said:

> They love ZONK! They really do. The kids. I tease them. Because they will take forever, a whole class period, give them you know, 8, 10 questions to solve and it would take them forever. You put it in a game setting then all of a sudden, they are ripping through 25 questions, work shown, you know, its like their minds just all of a sudden wake up.

The students showed enormous excitement for the game, and Josephine was heavily involved in helping students get excited about playing the game. She would use the game as a lure if the students seemed like they were having a bad day. Her last thought regarding the students' reaction was that it's a game "they look forward to". Josephine looked at some of the benefits of the game and mentioned student engagement. She noticed that it "takes them out of the standard especially because we are in math and it's so much work. It's a rigorous curriculum". There were personal benefits to Josephine including the ability to gather data and give instructional support when needed. She was also asked to identify any challenges to implementation. Some changes were made to the game to increase engagements and require all participation of student. Overall, the activity she modified had no visible challenges.

Some challenges were omitted because of their reference to a previous game played. Josephine felt that the implementation was most effective when: "Seeing them usually not doing work to they are active, they are working with their team, they are actually participating, and they have something on their page". This was observed as an "*Aha moment*". More students appeared motivated to join in and actively engage during gameplay. This was a moment that could be described as a moment of effectiveness.

The participant was asked about any advice she would give based upon her experience. She mentioned going "through the gameplay as if you're playing it… it seems so silly but go through the gameplay so that you can try to catch some kinks", "have a heart of flexibility" and "have every kid turn in something". The teacher should complete a test run so the game can go as smoothly as possible. It is also important to know that things will come up and you must adjust accordingly. Josephine's "screen turned off in the middle of the game" and it made her show negative expressions on her face. As a result, she stated to remain "upbeat" throughout the situation. She said "…have every kid turn in something. It increased the value for me as far as instruction and adapting what I needed to do for them as their teacher. And to try to ensure more students were participating". There is an accountability piece for all students and Josephine could check to ensure every student is working on the math problems within the game. Josephine believed that "some games may not be as geared for some levels as others. Some games that I can get to play with my 6th graders, the 8th graders might think that its lame". She felt that 8th graders would not get as hooked with the same game. It was also stated that classroom management and the game's difficulty should be taken into consideration for varying experiences.

Joe (7th grade teacher). Joe starts off the interview by describing gamification as "putting a tangible goal in front of the kids…it allows them to have a little fun while learning the mathematics behind it and "actually having a challenge to solve".

Table 10

7th Grade Teacher - Codes Used for One-on-One Interview (After Implementation)

Codes	Frequency (times mentioned)	Codes	Frequency (times mentioned)
Adaptation of game(s)	1	Implementation challenge	2
Characteristic	2	Movement	1
Competition	0	Participant new knowledge	1
Effective	1	Plan and expect	2
Emotion	0	Points	1
Engagement	5	Positive comment for use of games	1
Future consideration for games	0	Productive belief	0
Game element	3	Rules	1
Gamification	0	Transferrable	3
Goal	1	Unfamiliar with term	0
How games can be used	0		
		Total	25

Gamification is defined in terms of having a goal, reward and being engaged along the way. He is also expressing a need for the game to be movement involved, challenging and motivated to participate. The activity was an Egg Hunt where students, in teams, would search the area for problems to solve. After solving the problem, the question would be put back in the egg. Rewards would be given based upon the number of questions answered within a given time limit. Joe was asked about how students reacted to the game. He said that "70% of them were very enthusiastic and took on the challenge were very active in finding the eggs. About 5-10% of them checked out completely and sat down and did nothing, which was pretty typical". Joe expressed concerns for the rest of the class because they were "copying answers" but he also

stated that he thinks “it was very well received, and the kids were asking to do more activities like that”. The students expressed mixed reactions but the majority were engaged during gameplay.

Joe was asked about any benefits and challenges observed in the implementation of his game. He stated that engagement was a big benefit and that “the only way I(he) can compare it… is when we go through class one question at a time with a study guide or an old assessment”. There was a “higher percentage of students engaged in the activity”. He felt because there was a more engaged process involved, students also were engaged. Joe also noted some challenges were associated with the students. Some students were not following the rules and expectations established. Also, Joe noted an instance where he said: “I set my answer sheet down somewhere and several groups found my answer sheet and started writing the answers down”. He did not feel that the challenges compromised the “integrity” of the game but that more must be done to ensure the game cannot be exploited.

Joe was asked when he thought the game was most effective. He stated: “Their success was their eagerness and willingness to sort of wrestle and go out and find problems to solve instead of soft of reluctantly doing the problems that were on the board”. Visually, he could see a point where the game was effective through the students’ reactions. Some advice Joe gave based upon his own experience was to “Make sure that the number of kids participating is manageable” and “think through the whole process: think about what are you going to do, how’s it going to work, what can go wrong, how are you going to recover from things that can go wrong”. He believed that going through the gameplay increases the success of catching errors and makes the game less problematic. He ran into different problems like eggs breaking and students not re-inserting questions after finishing.

The last question asked how an experience would vary from one grade level to another. Joe simply stated that he thought "it's very transferrable" and he "can't imagine that" he "couldn't do something similar in just about every grade, not necessarily on the content but the game itself ". He felt that the game he made could be used at any level with little adjustment. His experience in developing the game showed parts that can be easily recreated. In the end, Joe states that there is no "fundamental difference" that he knows.

Table 11

8th Grade Teacher - Codes Used for One-on-One Interview (After Implementation)

Codes	Frequency (times mentioned)	Codes	Frequency (times mentioned)
Adaptation of game(s)	2	Implementation challenge	2
Characteristic	0	Movement	0
Competition	0	Participant new knowledge	0
Effective	2	Plan and expect	2
Emotion	1	Points	0
Engagement	1	Positive comment for use of games	3
Future consideration for games	1	Productive belief	5
Game element	0	Rules	1
Gamification	1	Transferrable	2
Goal	0	Unfamiliar with term	1
How games can be used	0		
		Total	30

Tonya (8th grade teacher). As a teacher in reflection, Tonya revisits how she defines gamification. There is still a basic understanding of the definition of gamification. She mentioned that: "I know that there were two terms introduced but I can't remember their names. I know my game fits under one of them because of the points piece". She is cognizant that there is a deeper level of gamification but is not able to recall them. Tonya has her students playing a game where they were hesitant at first but bought into the idea once they understood. Students

had to play multiple round until time was called. There were some benefits and challenges observed during the game play. Students were "resistant because they were unsure of their personal skills". Personal (Individual) skills represent their ability to master the mathematics standard addressed in the game. Tonya also observed that students were having discussions for problems that were incorrect. She stated that: "A couple of students got the answer wrong and they were able to explain why it was wrong and it made the game move by faster and easily". Students were self-correcting and doing so as a group. In the end, she felt that students were learning based upon the game they played. Students had to play the game multiple times to get the overall sequence of the game. She gave advice to those who would implement a game in their own classroom such as "create a game that is familiar with the students", play the game and plan accordingly". Tonya notes that additional challenges could be possible but planning and preparation will take care of most issues. The teacher should play the games before showing the students in order to become familiar with or get a feel of the game.

Emerging Themes Between Participants

Upon comparing the data collected from each participant, themes emerged from the established coding protocol. This occurrence allowed for emphasis of the following themes All of the themes introduced derive from the codes presented in Table 12.

Table 12

Combined Codes Used for Study (All Phases of Implementation)

Codes	Frequency Before Implementation	Frequency During Implementation	Frequency After Implementation	Totals
Adaptation of Game(s)	2	1	4	7
Characteristic	2	2	2	6
Competition	1	2	3	6

Table 12 (continued). **Combined Codes Used for Study (All Phases of Implementation)**

Codes	Frequency Before Implementation	Frequency During Implementation	Frequency After Implementation	Totals
Effective	0	0	4	4
Emotion	2	2	2	6
Engagement	0	5	10	15
Future Consideration for Games	0	3	1	4
Game element	8	1	4	13
Gamification	5	1	2	8
Goal	1	0	1	2
How games can be used	4	11	2	17
Implementation challenge	0	4	5	9
Movement	0	0	1	1
Participant new knowledge	0	0	6	6
Plan and expect	0	0	7	7
Points	2	3	3	8
Positive comment for use of games	5	7	7	19
Productive belief	0	2	6	8
Rules	9	8	3	20
Transferrable	0	0	5	5
Unfamiliar with term	3	0	1	4
Totals	44	52	79	175

Knowing the unknown. All three participants had a general idea of what gamification means. Josephine looked at gamification as "gamifying" activities. Joe looked at gamification as a means for "creating games that either reward students for their grasp of material or embed the material to be learned into the game". Tonya mentioned that gamification is "incorporating games into the classroom or taking a concept and putting a game into it". Josephine, Joe and Tonya expressed that they were unfamiliar with the term gamification but still had ideas of what a game should incorporate. Assumptions were made that it involves a game with a learning target. The definition used in the study and provided to participants is: The process of

introducing “game-based mechanics, aesthetics and game thinking” to produce or increase engagement and motivate individuals or groups to solve problems (Kapp, 2012, p. 10).

Initial reaction to games. Each participant had an experience related to games that was generally positive which lead into designing them own game. Josephine (6^{th}) stated that “games have a wonderful place in the classroom” and that it is a “way outside of what they are used to everyday”. Games were originally perceived by Josephine as a tool to review math content. Joe (7^{th}) stated that it involves engagement of the “natural competitiveness in children”. He feels that it is essential to the development of a characteristic in students. The engagement component is what helps students push themselves and he feels that can be applied to a classroom setting. Tonya (8^{th}) feels that games are a resourceful tool in the classroom if it is “helping the kids better understand the concept or giving them a different way to learn”. All participants initial thoughts on the use of games in the classroom is promising but Tonya (8^{th}) is the only one that included a stipulation.

Incorporation of game elements. Each participant provided a variety of characteristics that were related to game elements. Throughout the study, participants shared knowledge of what components possibly exist in a game. Many of the terms that were used shows that participants had an idea of what a game consist of. Those terms where then used to formulate their perception of gamification. Participants then used those elements within their own game. Josephine’s ZONK! game had points and questions became more difficult as the point value increased. Joe’s Egg Hunt game had rewards based upon the number of points a team had. Then, the points were based off the number of questions a team answered. Tonya’s Transversal Uno game allowed students to earn a point when they win a round. Although not mentioned after implementation,

the Uno game has evidence of re-playability. Table 13 shows different game elements and the time when they were mentioned:

Table 13

Game Elements Mentioned Before and After Implementation

Participant	Before Implementation	After Implementation
Josephine (6th)	Competition, Rules, Purpose, Goal, Groups, Points, Challenge	Characters, Scoring Points, Teams, Levels, Achievement, Competition, Environment, Engagement, Challenges
Joe (7th)	Competition, Skill, Engagement, Teams, Challenge, Points	Participation, Challenge, Engagement, Replayability, Rewards
Tonya (8th)	Activity, Fun, Re-playability, Teams	Points, Participation, Skills, Challenges

The table indicated how terms were consistently used before and after implementation of gamification.

Benefits to implementation. Each participant saw benefits to implementing gamification within their classroom setting. Their explanations were very detailed in regarding student reactions and data. Engagement was a common thread between participants. Josephine (6th) stated that students "woke up" and became more involved in participating. Tonya (8th) mentioned that all students were "participating" in having relevant dialogue between each other. Joe (7th) said, "70% of them (students) were very enthusiastic and took on the challenge". He referred to the process as being engaging and students wanting to complete the goal of the game.

Two participants (Josephine and Tonya) expressed that there was valuable data to collect during the game. Tonya (8th) overheard "discussions" between students regarding incorrect

answers that lead to getting a correct answer. This allowed the game to move at a faster pace though addressing possible misconceptions. Josephine (6th) saw students "struggle during gameplay" and "how they react to certain questions" and used it to adjust to meet each student's instructional needs. Josephine (6th) and Joe (7th) also expressed how they shared/used their game with other teachers.

Challenges to implementation. Two of the three participants experienced some type of challenge during the implementation of the game. Joe (7th) and Tonya (8th) had concerns that were related to students and their progress. Joe said that students were trying to "shortcut" the process. Some students were able to get the answer key. He did mention that this setback did not poison the "integrity of the game". Tonya stated that the students were showing "resistance in playing the game". She stated that they were "unsure of their personal skills (ability)". Tonya's concern dissipated once her students experienced the game and the math questions used in the design.

Josephine (6th) did not initially find any concerns during the implementation of her game. In another question addressed by the researcher, she mentioned that the "technology (smartboard and projector) turned off in the middle of the game". She remained flexible during that time and continued the game when she could. There were no concerns with the game itself. Challenges were present depending upon the perspective of the teacher. Some were student related and others were connected to technology. Each participant only mentioned one concern but had solutions for each.

Grade level variation. There was a mixture of viewpoints regarding how a teacher's experience could vary in different grade levels. Josephine (6th) felt that "some games may not be geared for some levels". She mentions that some games she plays with the sixth graders may

cause eighth graders to think it is “lame”. Josephine is stating that her games may not be successful when used in another grade level. She does mention that she “wouldn’t have the same multi-steps” if she tried the game in eighth grade. She is hinting that there may be a way to use it in 8th grade. Joe (7th) and Tonya (8th) feel differently about a game’s experience in other grade levels. Joe believes that any game is “transferrable”. As he thinks about the question, he tries to ponder situations that would make the game more difficult to play in another grade. He says: “I can’t imagine that I couldn’t do something similar in just about every grade”. The only exception he notes is that the “content” would need to be changed since it does not match the grade level standards. Tonya feels that the experience would vary based upon the “maturity level (of students), their understanding (what they know) and motivation”. At the end of the question, she says: “The game could probably have the same effect in another grade level”. She is indicating that the game has some type of transferability or that the experiences could be similar when designing and implementing games. All three participants describe varying degrees of playability in different many grade levels.

Future considerations. Many ideas appeared when participants were asked about consideration for future game designs and implementation. Each participant presented their take on ideas that would make the game better through design or implementation. All participants mentioned that the game should be played before offering it to students. Josephine (6th) asked that you “go through gameplay as if you’re playing it”. She also mentions that it “seems silly” but it is necessary to determine some of the “kinks”. Joe (7th) suggested that you “think through the whole process” before using it in the classroom. Knowing the mechanics of the game helps you determine any problems that may arise. Then, the problem can be corrected so that it does not occur. He ran into issues with students not putting questions back into the eggs and some

eggs broke. Tonya (8^{th}) states that a teacher should "play the game and plan accordingly". She is making sure that any issues that may arise are taken care of before students play the game.

Each participant addressed other considerations excluding the preliminary run of the game. Josephine understood that her game needed an accountability piece for each student. After her review of the game, students received a sheet to record their work on. She also observed an additional benefit from this change because student participation is verifiable now. Joe mentioned that he had too many participants at the time. Since the game was not manageable, he was less likely to ensure that the game was played properly. Tonya stated that a game should "be familiar with the students". Students can become engaged easily because of their expertise with the game.

Summary

Based upon the data collected and an analysis of the data from the study, answers to the research questions were found. The first research question focused on how middle grade mathematics teachers perceive the use of gamification. There were several perceptions that illuminated from the study. All participants had an overall positive experience with the implementation of their game when using them in the classroom setting. Teachers expressed student excitement related to their desire to actively engage in playing mathematics related games, even when the games are connected to a learning target as opposed to simply connecting to fun and entertainment. Although each participant designed their game differently with a focus on varying learning topics, there were similarities in their expressed perceptions.

The second research question focused on middle grades mathematics teachers identifying the benefits and challenges to implementing gamification. The findings showed that benefits and

challenges exist for each participant. Each challenge mentioned by participants was associated with a solution. Participants reflected and determined a solution for a variety of problems such that these problems or issues might become less likely to occur in the future. None of the participants had any concerns when designing their game. Challenges were confined to the implementation of the game. Many benefits were expressed including: engagement that was not previously observed in the classroom, an increase in knowledge pertaining to mathematics content, and an increased in the collection of assessment related data that can be used to address students' needs.

CHAPTER 5: DISCUSSION, CONCLUSIONS AND IMPLICATIONS

The purpose of this qualitative study was to determine how middle grades mathematics teachers perceive the use of gamification within their classroom setting. The study also gave insight to the benefits and challenges teachers may face in implementing gamification. Chapter five provides a summary of the qualitative study and a discussion regarding the findings of the study. The study's limitations will be explored as well as recommendations for future research.

Summary of the Study

In the beginning, the significance of the study was presented to determine why the researcher should investigate middle grades mathematics teachers' perception of gamification. It was determined that the literature was limited from the viewpoint of teachers in middle school. Literature on gamification was found in different subject areas, grade bands (K-5, 6-12th and post-secondary) as well as perspectives from a variety of viewpoints (students, managers, college and university professors). As a result, there was a focus on the term "gamification". Before understanding someone's perception of gamification, there should be a clear understanding of what gamification is. After gaining background knowledge on gamification, questions were formulated to address how mathematics teachers perceive gamification. The following main research questions were used to direct the study:

1. How do teachers perceive the use of gamification in the middle school mathematics classroom?
2. What are the benefits and challenges identified by mathematics teachers of implementing gamification in the middle school mathematics classroom?

Looking through the lens of a constructivist, the researcher sought information to build upon his current understanding of middle grades mathematics teachers' perceptions of gamification. The setting of the study took place in a southeastern U.S. school district with over 100 schools. The researcher's passion for games was set aside to ensure that the perspective of each participant was valued and presented. Specific questions were asked during interviews to support the research questions addressed. Protocols were used to ensure each interview was conducted properly. A journal prompt was used to help capture the words of the participant while the study was performed. Once the instruments were established, a framework for the case study was created as well as a procedure for collecting data. This framework included how the data would be coded for interpretation. The Atlas.ti8 software was used to create codes from the data and group them into themes. Member checking was used, as a method to ensure the voice of the participants was evident.

There were three participants included in this qualitative study. The participants used in the study were all mathematics teachers who were certified through the state and had worked with middle school students at the time of implementation. This example fell in line with purposeful sampling, where participants matched certain conditions and were interested in the topic presented in the study. As a result, the sampling represented in the study assists in contributing to the research gap of teachers' perception of gamification in middle grades mathematics classrooms. It addresses how mathematics teachers feel about the use of games, whether they had any background knowledge/experiences pertaining to the phenomenon and the benefits and challenges faced during the implementation phases.

Discussion of Findings

Researchers have an obligation to discuss how the study's findings correlate with current literature. It is a method to ground the structure of the study and re-emphasize the importance of conducting it. We start by reviewing the definition of gamification: Gamification is the process of introducing "game-based mechanics, aesthetics and game thinking" to produce or increase engagement and motivate individuals or groups to solve problems (Kapp, 2012, p. 10). The themes gathered from the previous chapter will be used to help organize the discussion of the study.

Familiarity with Games

Middle-grade mathematics teachers who participated in the study were all familiar with games they have used previously in the classroom setting. Game elements were defined, and participants showed some foundational skills necessary to implement a project based on gamification. Participants had the expectation that games have "a wonderful place in the classroom" (Josephine-6th), a "natural competitiveness" (Joe-7th) and that they help "kids better understand the concept" (Tonya-8th). Based upon the participants' responses, they have a belief that all students could benefit from the use of games. It starts with a belief that games can be developed for classroom use.

The National Council of Teachers of Mathematics (NCTM) developed a set of guidelines that ensures student success to mathematics learning through certain beliefs and actions. As stated in the literature review, productive beliefs should be adopted so that students are "appropriately challenged" and "encouraged to persevere" in solving problems (NCTM, 2014, p.11). Participants used what they knew about games and curriculum expectations to design a

game for the classroom. As a result, participants used questions that varied in point level and difficulty. A goal was set at the end of each game to help students persevere through the math problems given to their teams. The teacher observed problems that gave students a challenge and necessary adjustments were made to meet the needs of each child. All participating teachers observed some type of productive struggle and no frustration from students was documented.

Adequate levels of questioning techniques can lead to a higher level of understanding. Students should be allowed to combat problems that are simple and complex. Justifying solutions is a very important aspect to mastering content in any subject area. Participants allowed students time to "build upon their thinking" (NCTM, 2014, p.41) and required accountability through documentation. There was a recording sheet available for students in Josephine and Joe's classrooms. Tonya did not use a recording sheet but listened in on discussions related to the topic students were working on as she circulated the classroom while students worked. Each game provided the opportunity for students to share their understanding of the concepts, which led to the game being a valuable tool for seeing misconceptions. These behaviors provided opportunities to understand the teachers' perceptions of the value of game use in the mathematics classroom.

Adaptation to Gamification

Based upon the definition from Karl Kapp (2016), gamification includes a promotion of learning a skill/concept. The skill or concept can be new knowledge or focused on advancing a current knowledge base. To ensure that teachers would make a game based upon the characteristics of gamification, a definition was provided to offer a foundation. Through the first phase (Before Implementation), it was made aware to the researcher that participants had knowledge of aspects of gamification but were unfamiliar with the term itself. Each participant

was able to describe games in detail using phrases like: “an activity or enrichment, something that’s fun” and “an activity that involves competition”. Teachers developed games that met the standards in their content area (Common Core, 2010). There was no attempt to change the state required content that should be taught. Instead, the games were developed by incorporating elements within the already existing content or skills being addressed as related to the state required standards.

Within the participants’ game design, many elements are working together to meet the criteria for gamification. Josephine expressed having “points”, “rules” (if your teams gets a ZONK, you lose a turn), “competition” and being “in teams”. Joe stated that “points” are earned for every correct question. Students must search for eggs that are hidden throughout the area. The number of points is related to the number of “rewards” students can earn. Tonya had “rules” (if you get a question wrong, another player can answer your question and make you draw a card) and ways to earn “points”. Based on the participants’ comments, it is evident that participants were using “game-based mechanics and aesthetics” to enhance the learning and retention of a skill or skills (Kapp, 2014, p.10).

Participants designed a game for the purpose of helping students learn a new concept or gain additional knowledge on something previously taught. As a result, the development of the game led teachers to produce a constructivist’s mindset. Amineh & Asl (2015) stated, “constructivism describes the way that the students can make sense of material and also how the materials can be taught effectively” (p. 9). Participants have an opportunity to shape an experience for their classroom. At the same time, reminding themselves to establish an importance to proper game development. The problems are challenging and allows for the prospect to receive feedback (Kapp, 2012). Josephine was able to provide her students with

feedback after each question was answered. Tonya's students were providing each other with feedback based upon the questions they put down from each card. Joe was able to use an "*answer key*" to provide feedback as students searched for problems within eggs. The environment, created by the teacher, provides students with an opportunity to build upon their understanding. In return, students learning experiences can be maximized and teachers can address the needs of their students.

Benefits to Gamification

Participants expressed a positive experience when implementing gamification within their classroom settings. Based on participants' responses, there are some benefits to using games including increased motivation and engagement, successful use of cooperative learning and using assessment to drive instruction further. In the subsequent paragraphs, each benefit will be described in greater detail.

Increased motivation and engagement. Participants designed their game with the hopes that students get hooked to it. As the game is played, students start to learn what it is about and whether there is any playability. Although the main objective of the teacher is to ensure that learning takes place, they still want to see that students are enjoying the game and class. Kapp (2012) expresses the fact that motivation and engagement are essential to having an effective game. If the game is not engaging, then students will not receive the learning value hidden within. All participants mentioned that students were engaged in the games presented to them. Josephine stated that she felt the game was most effective when saw students "who do not usually do work" to becoming "active" and "asking questions". Joe's most effective moment was when he saw "their eagerness and willingness to sort of wrestle and go out and find problems to solve". Tonya saw engagement through "student participation" when they were conversing with

each other and discussing the questions on cards. Intrinsic motivation was observed in every scenario where students did something for the benefit of understanding.

Encouraged cooperative learning. An integral part of being a mathematical thinker includes the need to problem solve and work in cooperative groups. The Common Core Standards Initiative (CCSI, 2010) describes implementing opportunities for students to work in collaborative groups so that it mimics traits needed in a future workforce. When a collaborative group is structured correctly, students are able evaluate problems and determine the most efficient methods collectively. The discussions could lead students to a higher level of critical thinking. All participants designed their games for students to work in collaborative groups. Josephine's ZONK! game was made for teams to compete against each other. Joe's Egg Game had students work in pairs to solve problems. Tonya's Uno game had a group of students but are playing against each other to earn points. Each game was developed different but still had some form of cooperative groups displayed. This form of learning also lends to the idea that students could lead discussions (like Tonya) that engages in academic discourse and assist others if misconceptions exist (Capar & Tarim, 2015; NCTM, 2014). Above all, teachers must organize groups in a manner that are productive and reduce instances where classroom management are a concern.

Elements of gamification can also be observed as a derivative of the Social Learning Theory. Bishara described social learning as "a method by which individuals learn from one another in the context of a social situation through observation" (as cited by Kapp, 2012, p.70). In cooperative learning groups, students are increasing their knowledge though learning from the experience of others. From dialogues and discussions, students working together increase occurrences of the desired behavior. This means that teachers must be cautious of how groups

are established. They should also be an authority in setting expectations so that learning can occur.

Assessment uses. Teachers must assess their students to determine where they are functioning currently and prescribe a plan to meet the educational needs of students. Assessment (whether formal or informal) can be an opportunity for teachers to learn more about their students. During the implementation of each game, participants found a way to assess their students' level. Assessments came through the form of ensuring that each student had paper to write on, providing feedback on solutions given after a math problem and listening in on discussions students have during gameplay. Participants were able to identify where students were in their learning (William, 2011).

Immediate feedback is ultimately necessary for students when engaging in gameplay that involves learning or reviewing a skill (Stott & Neustaedter, 2013). Teachers must be willing to challenge students to conduct error analyses so students can utilize better methods for problem solving while in the moment. In return, students have the capability to devise action steps to correct the problem. Students build upon their current knowledge and become better "self-assessors" (NCTM, 2014, p. 95). Each participant did some type of assessment to determine if students were grasping the concept delivered. All participants mentioned either having a quiz at a later determined date, a record sheet to review and see what students need help or to gauge what students know before a formal assessment is administered. The mentioned benefits all contributed to the successful implementation of gamification.

Challenges to Gamification

The challenges to implementing gamification came to light when Ross (2013) mentioned some of the students in his study came with some issues that included: “work avoidance, school, avoidance, acting out in class and poor relationships with school personnel” (p.1). Although this was not evident in other studies reviewed in chapter two, participants spoke to two different types of challenges: those that involve the game and those that involved the students. Joe was having a difficult time with a small group of students not being engaged and being fair in getting answers. He did mention that majority of his class was productive in the game’s learning process. Josephine stated that her technology failed on her at some point, which halted the game. Ross (2013) noted in his study that there were some concerns with implementation but were mainly focused on those that involved implementing the game. Tonya had students that were hesitant about playing because of their doubts of understanding the concept.

There are many elements that determine the composition of a game (Kapp, 2012). When one or more of those elements is implemented inappropriately, the engagement level may decrease along with the game’s effectiveness. Fortunately, participants strayed away from some of the concerns mentioned from previous studies like the feeling of increased record keeping. Challenges were evident with each participant but were not highly emphasized.

Recommendations from Participants

Each participant mentioned ideas that could prove useful when implementing gamification. As a researcher, it is important to value the notions of those who experience the study by participating. The recommendations were developed from the perceptions that each participant obtained. These perceptions provided proposals to the researcher for what possibly

could be considered for future implementation (Sanchez-Mena & Marti-Parreno, 2017) Table 14 provides a list of challenges and benefits and some recommendations made by participants.

Table 14

Participant Suggested Implementation Strategies for Gamification: Structural & Content

Study Finding	Challenge or Benefit	Solutions/Enhancements
Participants (6^{th}, 7^{th}, 8^{th}) found issues during gameplay	Challenge	Playing the game is necessary to sort out any concerns
Participants (6^{th}, 7^{th}, 8^{th}) saw majority of students engaged	Benefit	Develop a method that requires all students to participate – an accountability piece
Students were hesitant about playing a game unfamiliar to them - Participant (8^{th})	Challenge	Try to pick a game that is familiar to them so that it is more about the content than the game
Participants (6^{th}, 7^{th}, 8^{th}) feel that games have some transferability	Benefit	Determine ways for games to be used in multiple grade levels
A participant (7^{th}) had a lot of noise coming from students; participant grouped up with another teacher to utilize the game	Challenge	Keep the number of players in a game at a manageable level
A participant (6^{th}) technology turned off unexpectedly	Challenge	Have a heart of flexibility, remain upbeat. Sometimes things just go wrong
Two participants (6^{th},7^{th}) shared/used their innovation with teammates	Benefit	Constructive criticism Discussing the benefits/challenges and determine how to make it better

Palys (2008) suggests that teachers immerse themselves in a study that pertains to them so that there is a personal benefit to understanding. This value allows participants to become engaged in the process and make recommendations so that the effect for future implementation is amplified.

Researcher Comments

The research methodology was followed and helped in establishing a plan for conducting the study. It is evident that this is the most crucial part of the study as it determines the validity of your data. As a researcher, it helps to stand along other researchers when you have systematic approaches to developing a case study, creating the best environment for collecting data and coding (open, axial, selective).

Based upon the data collected, it is evident that participants (who are teachers) benefited from the process. They now have a more definitive understanding of gamification and different ways it can be integrated in the mathematics classroom. This was also used as time to share with other teachers of middle-grades mathematics their game and how it worked for their students. Participants were drawing teachers in based upon the usage of the game they created.

Implications for Future Practice in Local Context

In the district that I serve, there are many middle-grades mathematics teachers that could benefit from implementing a new practice. Although it may be somewhat familiar to them, having a linear process for all teachers to follow would be beneficial. There are also many paths that could be blazed in order to excite future practices of gamification. The first call to ensure that teachers are implementing gamification effectively could be providing professional development. The professional development would need to be geared towards those who are most interested in the practice, as opposed to those who do not (Kennedy, 2017).

Professional development should be structured based upon the format used in the study. Table 15 describes a sample process for conducting professional development based upon the study:

Table 15

Proposed Topics and Timeline for Professional Development: Gamification

Proposed Topic	When
Understanding Gamification: What is it?	Before Implementation
Gamification in Action: Make and Design Your Game– Describe your game and Build it	Before Implementation
Gamification in Action: Play your Game and Take notes	During Implementation
Gamification Reflection – What's next?	After Implementation

Kennedy (2017) also states that teachers would need time to practice ideas learned from professional development with their students. The timeline shown in Table 15 provides a section that includes time for game implementation with students. Students assist teachers in gathering real-time data during the implementation of the game (as noted in Ross, 2013). This includes the effectiveness of the game and how students are reacting to the game's mechanics. Interested teachers would require on-going development so that their practice can be modified. Eventually, teachers who are not interested it may become attracted once they see other teachers benefit from implementation.

Limitations of Findings and Recommendations for Future Research

While immersed in the role of a researcher, understanding the limitations within a study is essential. This qualitative study was grounded on procedures that would help validate collected data such as constant comparative analysis and member checking. Although a process for collecting and analyzing qualitative data was in place, there are areas of the study that limits a higher level of theoretical grounding.

There was a limited number of participants selected during the sampling process. Purposeful sampling was used to ensure that there were participants who met a certain criterion (Palys, 2008). Unfortunately, the sampling was also convenience because the researcher utilized those who were available lessening the chances of producing a random sample. Based upon the number of participants used, it is difficult for a qualitative researcher to make generalized statements regarding a certain population. The data produced from the three participants is rich, gives vivid descriptions of accounts but lacks a sample size more commonly found in quantitative data to create new theories. The participants varied in education, age, grade taught, gender and ethnicity. All participants experienced using games in the classroom before the implementation of gamification had commenced. An area for exploration would be to understand teacher perception when they have not used a game in their classroom. Sequentially, an analysis could be conducted of the perception between those who used games versus those who have not used games in the classroom.

This study could also prove useful in building a case to understanding teacher perception across subject areas such as science, social studies, language arts and reading. The participants used were mathematics teachers in the sixth, seventh and eighth grades. Many of the game-based studies used to describe a gap in literature were related to other subjects and grade levels.

Conclusion

Gamification will continue to be a trending topic as more teachers attempt to find diverse ways to connect with students in the classroom arena. Effective implementation of gamification requires that teachers have knowledge of how game mechanics work and a comprehensive list of elements that can be incorporated. Instructions for implementation would also be integrated to ensure that a game is well-designed and less likely to fail. This qualitative study provided solutions to the following questions:

1. How do teachers perceive the use of gamification in the middle school mathematics classroom?
2. What are the benefits and challenges identified by mathematics teachers of implementing gamification in the middle school mathematics classroom?

Based upon the findings of this study, there are a few themes that emerged from the data: (a) some teachers may already have a background in using games which informs their perception, (b) certain characteristics/game elements are needed if an individual wants to implement gamification, (c) middle-grades mathematics teachers have generally positive views about gamification and the use of games in the classroom, (d) teachers saw both benefits and challenges to gamification, (e) gamification can be used from one grade level to the next and (f) planning and preparation is key to successful implementation. One major benefit that was mentioned by middle-grades mathematics teachers was students becoming more engaged in the learning process. Whether the game was for review or to learn something a little less familiar to them, students were motivated to play a game produced by their teacher. Teachers who expressed challenges still saw benefits to implementing gamification. They are also motivated to not only provide more opportunities to play games but modify their games to make them even

better. With this perspective in mind, it is hopeful that more positive experiences will bloom from implementing gamification.

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Appendix A

Individual Consent Form

SIGNED CONSENT FORM - KSU IRB Study # 19-416

Title of Research Study: Can Games Work for You? - Teacher Perceptions of Gamification in Mathematics Grades 6-8

Researcher's Contact Information:

Joseph Brigham

678-749-4363

Jbrigha2@students.kennesaw.edu

Introduction

You are being invited to take part in a research study conducted by Joseph Brigham of Kennesaw State University. This study is a part of my dissertation research. Before you decide to participate in this study, you should read this form and ask questions about anything that you do not understand.

Type of Project

Case Study

Description of Project

The aim of this study is to determine the impact implementing gamification has in the middle school mathematics classroom. The study will also explore middle school mathematics teachers' perceptions when elements of gamification are in use within the classroom. My dissertation will thoroughly examine the experiences of teachers implementing gamification in their professional setting and provide a detailed synopsis of their perception. As a result, findings from this study will provide additional knowledge in the use of gamification in the middle school setting.

Research Questions

1. How do teachers perceive the use of gamification in the middle school mathematics classroom?
2. What are the benefits and challenges identified by mathematics teachers of implementing gamification in the middle school mathematics classroom?

Explanation of Procedures

You will be asked several brief questions during two interviews. Both interviews will be semi-structured and one-on-one (between the researcher and participant). Conducting a semi-structured interview will allow me to ask a set of open-ended questions and follow-up questions if necessary, depending upon the flow of the discussion. You are also allowed to stop and ask any questions you have throughout the study. The interviews will be audio-recorded for later transcription and coding purposes. You will be given directions to follow regarding implementation procedures and a journal prompt to complete after. All documentation (audio and writings) will be stored on a password-protected computer that only the researcher has access to. Once the project is complete, the information (including any identifying information) will be deleted. All identifiable information will be kept confidential and pseudonyms will be used.

Time Required

Each interview including time for possible follow-up questions should be no more than 30 -45 minutes in length. The study shall conclude after no more than four weeks.

Risks

There are no known risk in participating. Any identifiable information or information regarding participation will not be available to other individuals.

Benefits

An identifiable benefit to you, as a mathematics teacher, is possibly gaining a heightened awareness of your own perception to the innovation presented. Also, additional information about gamification usage may occur. The researcher may learn more about how teachers perceive gamification as it relates to motivation and/or other characteristics that may come about. The findings from the study will provide additional information to the field of education and the increase the amount of literature related to gamification in middle grades (6-8th).

Confidentiality

The results of this participation will be anonymous. No personal, identifiable information will be collected and data will be stored on a password-protected computer. Any physical documents will be in a secured place located away from public access.

Inclusion Criteria for Participation

Age of participants will be 18 years of age or older. Anyone below the age mentioned will not be allowed to participate in the study.

Signed Consent

I agree and give my consent to participate in this research project. I understand that participation is voluntary and that I may withdraw my consent at any time without penalty.

_____

Signature of Participant or Authorized Representative, Date

_____

Signature of Investigator, Date

_____

Signature of Principal at Participating School, Date

PLEASE SIGN BOTH COPIES OF THIS FORM, KEEP ONE AND RETURN THE OTHER TO THE INVESTIGATOR

Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 585 Cobb Avenue, KH3417, Kennesaw, GA 30144-5591, (470) 578-6407

Appendix B

One-on-One Interview Script (Pre-Implementation)

Thank you for agreeing to be a part of the study. **KSU IRB Study # 19-416**

As you know, the purpose of this study is to investigate the benefits and challenges of implementing gamification in the middle-grades mathematics classroom. It will thoroughly examine middle-grades mathematics teachers' perception of the use of gamification within their educational setting. It is hoped that my dissertation informs researchers and teachers of the possible benefits/challenges related to implementing an activity that infuses gamification in Grades 6-8.

You will be asked several questions during this one-on-one interview. The interview will be audio recorded for transcription and coding purposes. The interview will be stored on a password-protect computer, allowing only access to the researcher. It will be deleted when the study is completed, and no identifying information will be used. I encourage you to be open and honest.

Thank you again for agreeing to participate in this one-on-one interview. Let's begin.

Interview Questions (Pre-Implementation):

1. Describe what does the term "game" means to you.

2. What elements do you feel are needed to make an effective game?

3. How do you feel about the use of games in the classroom?

4. Identify a game you recently used in the classroom. Describe it in detail and explain why you chose the game to use with your students. (*Follow-up question below if participant has never had an experience - *If you have not used games in your classroom, explain why not.)

5. What is your familiarity with the term "gamification" as it relates to education?

6. Describe what you think the term "gamification" means as it relates to education?

Other Questions: TBD (Based upon information received from the initial questions asked.

Appendix C

One-on-One Interview Recording Sheet (Pre-Implementation)

(To be used after script is read to participant.)

KSU IRB Study # 19-416

Question	Response from Participant
1. Describe what does the term "game" means to you.	
2. What elements do you feel are needed to make an effective game?	
3. How do you feel about the use of games in the classroom?	
4. Identify a game you recently used in the classroom. Describe it in detail and explain why you chose the game to use with your students. (*Follow-up question below if participant has never had an experience)	
5. What is your familiarity with the term "gamification" as it relates to education?	
6. Describe what you think the term "gamification" means as it relates to education?	

Follow Up Questions:

1. If you have not used games in your classroom, explain why not.

2.

3.

Additional Comments (from Participant)

-

Appendix D

One-on-One Interview Script (Post-Implementation)

Thank you for agreeing to be a part of the study. **KSU IRB Study # 19-416**

As you know, the purpose of this study is to investigate the benefits and challenges of implementing gamification in the middle-grades mathematics classroom. It will thoroughly examine middle-grades mathematics teachers' perception of the use of gamification within their educational setting. It is hoped that my dissertation informs researchers and teachers of the possible benefits/detriments related to implementing an activity that infuses gamification in Grades 6-8.

You will be asked several questions during this one-on-one interview. The interview will be audio recorded for transcription and coding purposes. The interview will be stored on a password-protect computer, allowing only access to the researcher. It will be deleted when the study is completed, and no identifying information will be used. I encourage you to be open and honest.

Thank you again for agreeing to participate in this one-on-one interview. Let's begin.

Interview Questions (Post-Implementation):

1. In your own words, describe gamification as it relates to education.

2. Summarize what your activity was and its components.

3. Explain how your students reacted to the activity you used.

4. Did you examine any benefits to the implementation of your activity? Explain.

5. Did you examine any challenges to the implementation of your activity? Explain.

6. When did you feel that your implementation of gamification was most effective?

7. What advice would you give to someone who wanted to create an activity based upon gamification?

8. How might a teacher's experience vary from one grade level to another?

Other Questions: TBD (Based upon information received from the initial questions asked.

Appendix E

One-on-One Interview Recording Sheet (Post-Implementation)

(To be used after script is read to participant.)

KSU IRB Study # 19-416

Question	Response from Participant
1. In your own words, describe gamification as it relates to education.	
2. Summarize what your activity was and its components.	
3. Explain how your students reacted to the activity you used.	
4. Did you examine any benefits to the implementation of your activity? Explain.	
5. Did you examine any challenges to the implementation of your activity? Explain.	
6. When did you feel that your implementation of gamification was most effective?	
7. What advice would you give to someone who wanted to create an activity based upon gamification?	
8. How might a teacher's experience vary from one grade level to another?	

Follow Up Questions:

1.

2.

3.

Additional Comments (from Participant)

-

Appendix F

Directions for Teachers Regarding Implementation

KSU IRB Study # 19-416

Dear Participant,

Thank you for participating in the one-on-one interview (Pre-Implementation Phase). At this point, you will be participating in the next phase of the study. It requires you to develop an activity based upon your understanding of gamification.

Please allow yourself the following timeframe to effectively design, implement and reflect upon your interpretation. I will check with you at the end of each week to see if you have any concerns. Please feel free to contact me regarding any concerns using the information provided on the consent form. If you complete a week early, please feel free to move on to the next week's activity. Any questions you may share with me related to this process will be documented and used for analysis as well.

Week 1: Review Instructions/Pick a standard or standards to use

Week 2: Brainstorm ideas for Design of Activity & Design It!

Week 3: Gamification in Use- Implement the Activity

Week 4: Reflection

Week 1: Review Instructions/ Pick a standard or standards to use

What is gamification? – The definition provided will come from Karl Kapp:

The process of introducing "game-based mechanics, aesthetics and game thinking" to produce or increase engagement and motivate individuals or groups to solve problems (Kapp, 2012, p. 10)

There are two types of gamification, structural and content. Structural gamification is the "application of game elements to propel a learner through content with no changes or alteration to the content" (2016, p.137).

Elements mentioned: points, levels, badges, leaderboards, and achievements

Content gamification is the "application of game elements, game mechanics and game thinking to alter content to make it more game-like" (2016, p. 138)

Elements mentioned: story, mystery, characters

More information about both can be reviewed here:

http://www.centeril.org/2016HANDBOOK/resources/Cover_Kapp_web.pdf

Jot down notes below regarding your understanding of gamification now that you have been formally introduced to a definition. You will use this later in the study:

*If additional space is needed, please feel free to write on additional sheets of paper.

*What standard or standards will you use to design your activity? If additional space is needed, please feel free to write on additional sheets of paper.

Answer:

Week 2: Brainstorm Ideas for Design of Activity & Design It!

Welcome to the next phase of the study! Here, you will jot down ideas of the activity you plan to design and implement. There are no restrictions outside of time constraints. In order to pace yourself, please refer to the timeline provided at the beginning of this document.

Please feel free to contact me regarding any questions/concerns using the information provided on the consent form.

Now that you have an idea of what you want to create, design it so that you can implement it the following week!

Week 3: Gamification in Use- Implement the Activity

Plan the day(s) for which you will use the activity with your class. Be sure to have prepared all materials so that implementation is as smooth as possible. Take a picture of the activity.

*Make sure that the picture does not show any faces of persons/students or identifiable information (names, ID numbers, school, etc.).

Please feel free to contact me regarding any questions/concerns using the information provided on the consent form.

Anything you want to make notes of can be written below-

Notes:

*Week 4: Reflection is located on *Appendix G*.

References

Kapp, K. M. (2012). The gamification of learning and instruction: game-based methods and strategies for training and education. John Wiley & Sons.

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Appendix G

Journal Prompt: Reflection on Gamification Application

KSU IRB Study # 19-416

Week 4: Reflection

In this journal prompt, you will write about the process you went through to create your activity. Explain the design of your activity in detail (e.g. how it works, connection to standard(s), what components of gamification are used, how you know if students learned, etc.). Include a picture of the activity. You can write as much as you want to get your point across.

*Make sure that the picture does not show any faces of persons/students or identifiable information (names, ID numbers, school, etc.).